



The Independent Guide to
IBM Personal Computers

Volume 2
August 1983

Number 3

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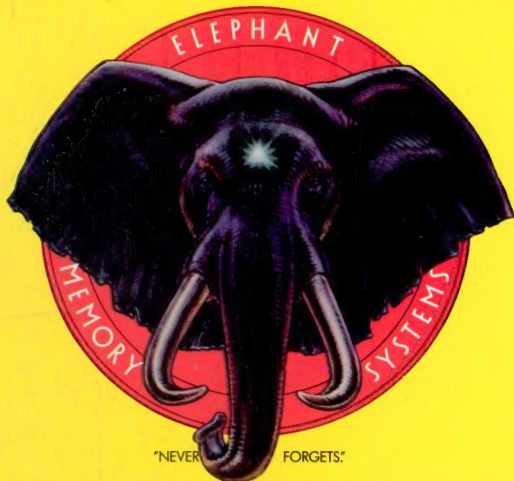
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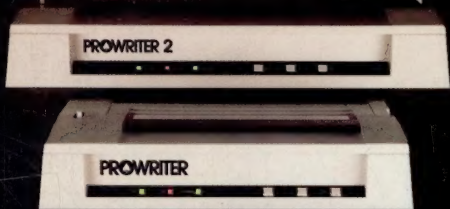
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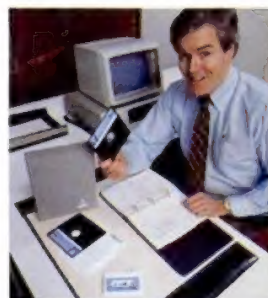
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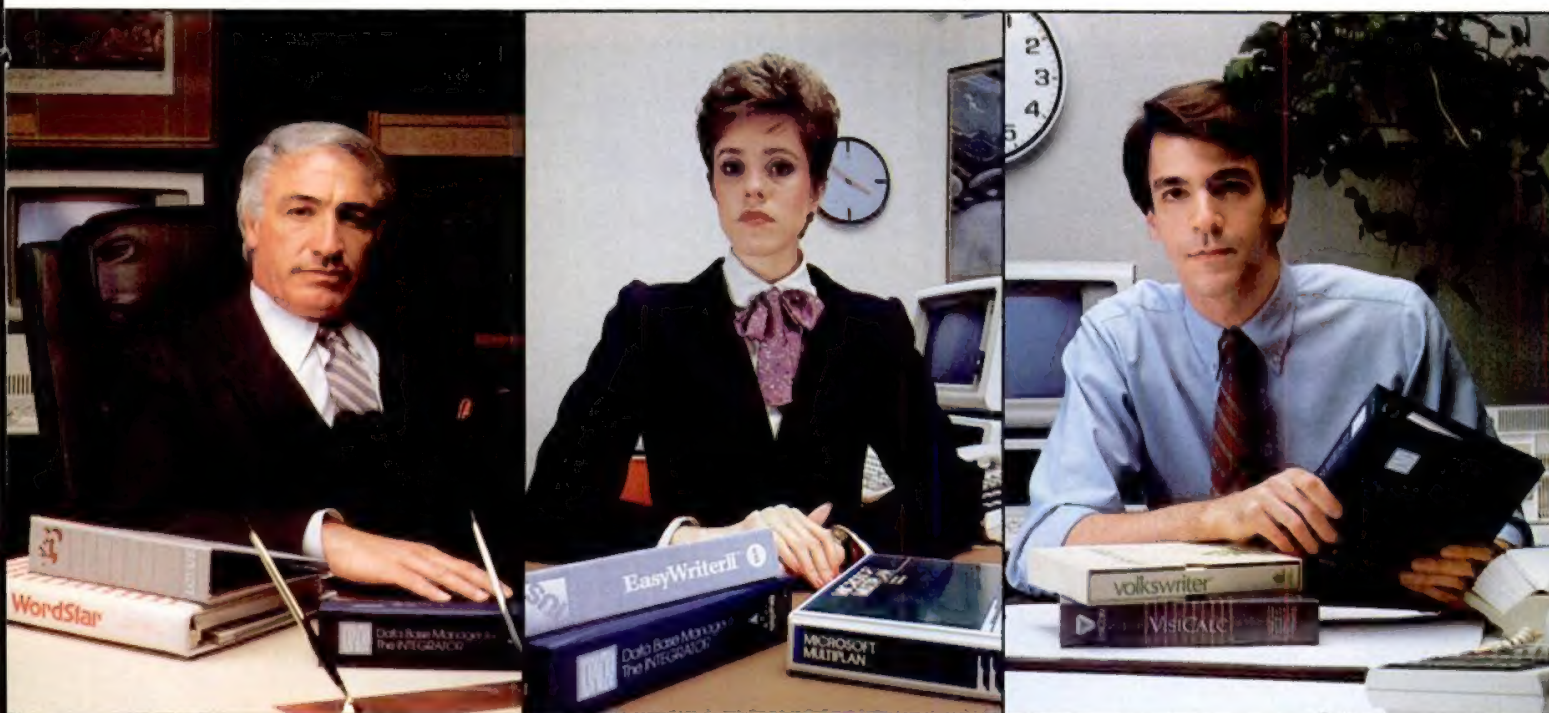


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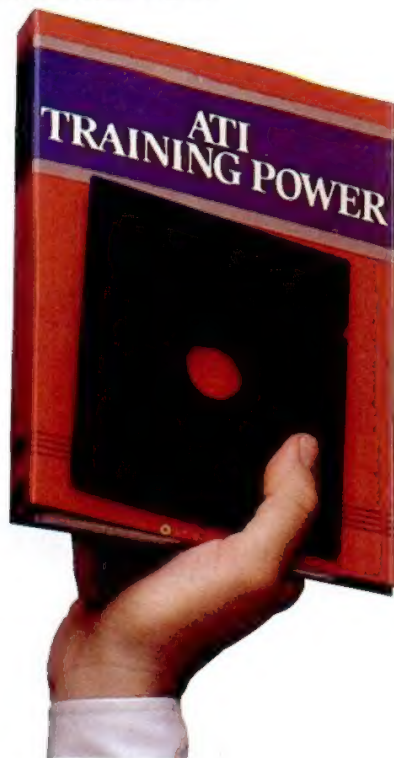
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- ☐ SuperCalc
- ☐ VisiCalc
- ☐ Microplan
- ☐ EasyPlanner
- ☐ PeachCalc

Accounting

- ☐ BPI Gen. Acct. (new!)
- ☐ MS DOS
- ☐ CP/M
- ☐ CP/M-86
- ☐ APPLE II DOS
- ☐ APPLE IIe 80 col.
- ☐ XENIX

Database Management

- ☐ dBASE II
- ☐ EasyFiler

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- ☐ PC DOS
- ☐ MS DOS
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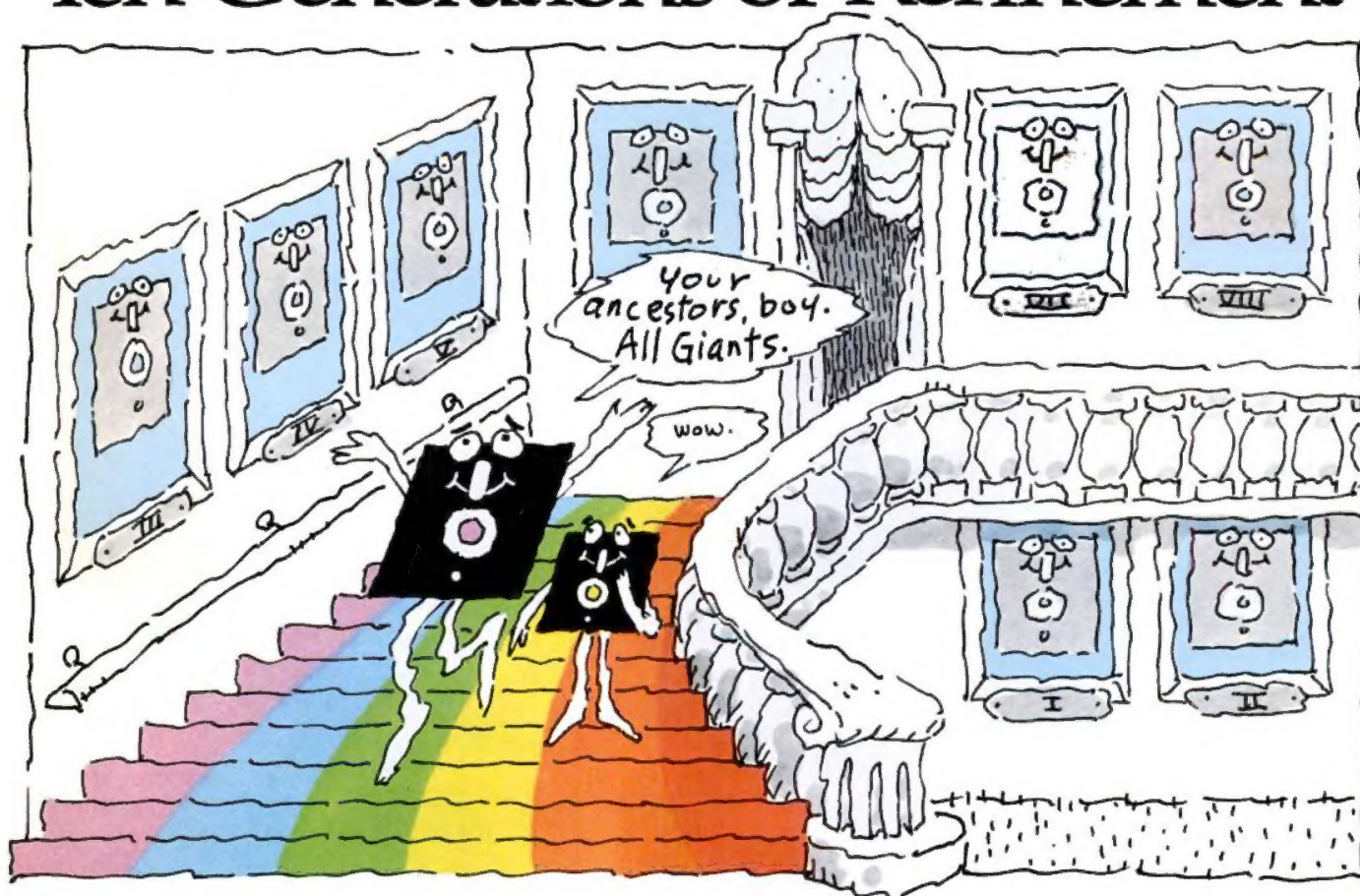
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The Independent Guide to IBM Personal Computers

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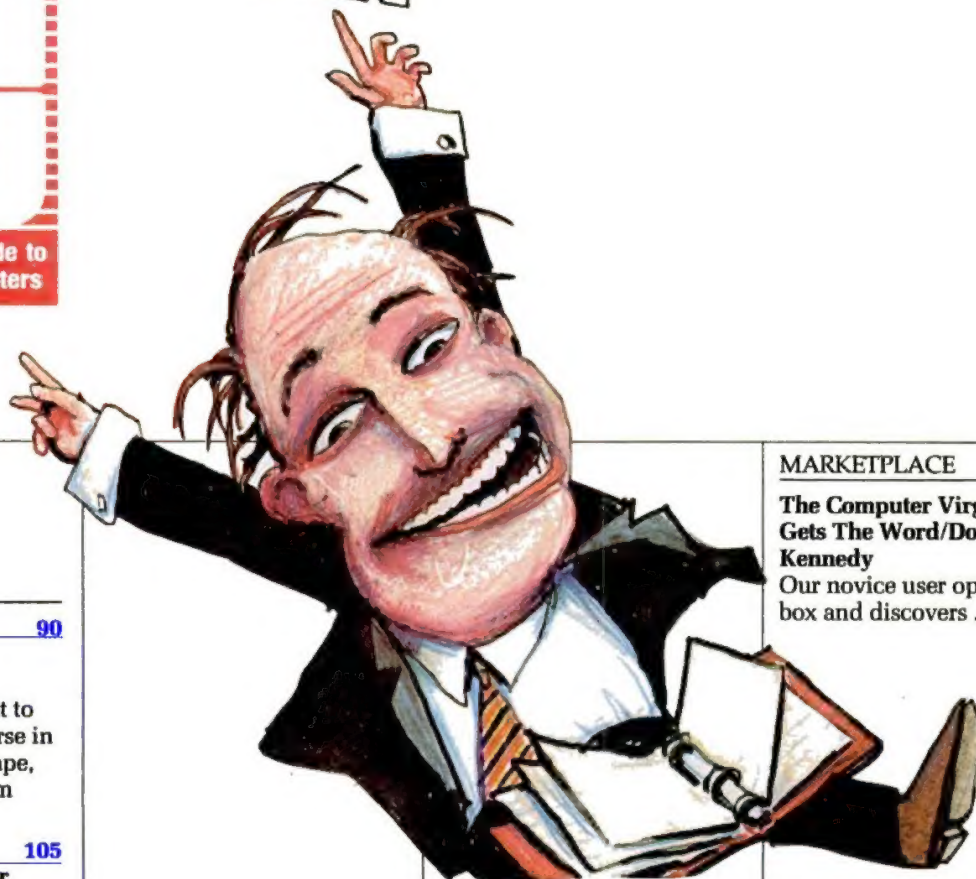
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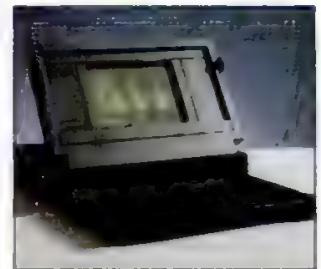


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It took hundreds of years to build the world's most advanced spreadsheet.

Way back in 1534, a Venetian scholar wrote a text that standardized the techniques of modern bookkeeping. And up till 1979, there weren't a lot of real improvements in the way people did spreadsheets. You still had to enter all your figures by hand. Run all the totals yourself. And when you had to make a few changes, you had to run the totals all over again.

Then along came a program that let you create spreadsheets on a personal computer. Without touching a pencil. Or adding anything by hand. Best of all, this new program gave you the freedom to look at your balance sheet a dozen different ways if

you felt like it. Because all you had to do was change one figure, and the computer would refigure everything else for you. Automatically.

Like most breakthrough ideas though, this original spreadsheet program had a few things that definitely needed improvement. For instance, all the columns had to be the same width. And the entire system took about 20 hours to learn.

So we developed SuperCalc®, which was such a giant step in the

right direction that it became a best-seller. Over 250,000 copies in only 18 months.

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SuperCalc².

1534

1540 Adi ultimo

194 P Pro et danno // A doni usari, per
tratto in resto, per saldo di quello 8

195 P Pro et danno // A Spese di mure
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1548 20 P 14

196 P Fitti della possessione da Moian //
per futo di quella per l'anno presente
1541, per saldo de quelli 45 8

197 P Pro et danno // A Spese di mure
l'anno presente, come in esse appar,
1998 12 P

198 P Pro et danno // A Spese di mure
piu spese fatte l'anno presente, come
per saldo di quelle 48 8 12 P

199 P Pro de trecha in monte // A Pro
lita seguida, come in quello appar,
150 8 P

200 P Pro et danno // A Cauadal de mi A

1979

STATEMENT

	JAN 1980	FEB 1180
SALES		
COST	500	330
GROSS	700	770
R & D	160	176
MARKETING	200	224
ADMIN.	140	151
TOTAL	500	551
INCOME	200	219
TAXES	80	80
NET	120	131

1981

INCOME STATEMENT

NET SALES	11
COST OF GOODS SOLD	:
GROSS PROFIT	:
RESEARCH & DEVELOPMENT	:
MARKETING	:
ADMINISTRATIVE	:
TOTAL OPERATING EXPENSES	:
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With SuperCalc² you get all kinds of features that have never been possible before. Like custom formatting capabilities. Automatic consolidation. Sorting. And more. Take a look at the spreadsheet below, and you'll see just how much we're giving you.

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step by step. And an AnswerKeyTM that gives you instant help right on the screen. Because of these features, you can actually create your first spreadsheet in 10 minutes flat. Even if you've never used a computer before.

SuperCalc² is available for the IBM PC and XT. Where it can run in full color. With full memory. Even on hard disk. It's also available for CP/M, CP/M-86, MS DOS and other operating systems, so you can use it with most popular personal computers.

But with all its advanced features, SuperCalc² is the same price as the original SuperCalc. Only \$295, suggested retail. We're also offering SuperCalc for only \$195. And an upgrade to SuperCalc² whenever you're ready.

So. If you've always thought there had to be a better way to do your spreadsheets, stop by your closest computer store. And take a good look at SuperCalc². After just 10 minutes, you won't want to do one more spreadsheet the old way.

1983

Combines any number of spreadsheets —automatically!

Calendar/date capabilities.

Percentages.

COMPANY CONSOLIDATED MONTHLY PAYROLL

Today's Date	4/15/83	Deduction Percentages
Payroll Start Date	4/ 1/83	Fica 6.700%
Days this period	15	SDI .8%
Recalculate YTD Y/N ?	N	

User-set decimal places.

Emp#	Employee name	Status	Gross Salary	Total Deduct	Net Pay	YTD Gross
34	Adams	M	\$1,100.00 (\$82.50)	\$1,017.50	\$6,200.00	
49	Beckette	S	\$750.00 (\$56.25)	\$693.75	\$5,250.00	
84	Johnson	S	\$850.00 (\$63.75)	\$786.25	\$5,950.00	
92	Jones	M	\$900.00 (\$67.50)	\$832.50	\$6,300.00	
12	Samson	S	\$560.00 (\$42.00)	\$518.00	\$3,920.00	
19	Santos	M	\$650.00 (\$48.75)	\$601.25	\$4,550.00	
45	Smith	S	\$700.00 (\$52.50)	\$647.50	\$4,900.00	

Total # employees 7 Floating \$ signs.

Embedded commas.

Total Gross Salaries (100's)	\$55.1
Total Deductions (100's)	\$-4.1
Total Net Pay (100's)	\$51.0

Negative numbers in ().

Arrange reports numerically or alphabetically, like this

Numbers in 100s or 1000s.

SuperCalc²

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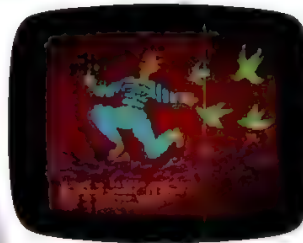
Some of the games you see on these two pages help exercise your child's creativity. Others help improve vocabulary and spelling skills. While others

improve your child's writing and reading abilities. And all of them help your child understand how to use the computer.

So if you're looking for computer programs that do more than just "babysit" for your kids, read on. You'll find that our Early Learning Programs are not only compatible with Apple®, Atari®, IBM® and Commodore 64™ computers, but also with kids who like to have fun.



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Plus, it makes it fun for kids to read, helps them understand how words and rhymes create poetry and lets them take fragmented thoughts and rearrange them to form coherent verse.



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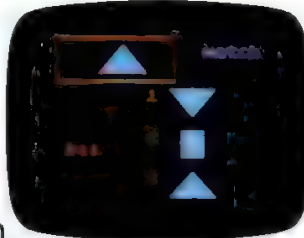
STORY MACHINE is like a storybook come to life. Using the keyboard, your children write their own fun little stories. The computer then takes what they've written and animates their story on the screen, com-



plete with full color graphics and sound. STORY MACHINE helps your children learn to write correctly, become familiar with the keyboard, and lets them have fun exercising their creativity at the same time.

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KINDERCOMP is a game that allows very young children to start learning on the computer. It's a collection of learning exercises that ask your children to match shapes and letters, write their names, draw pictures, or fill in missing numbers. And KINDERCOMP will delight kids with color-



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PC REPORT – IBM users group of
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PC MAGAZINE

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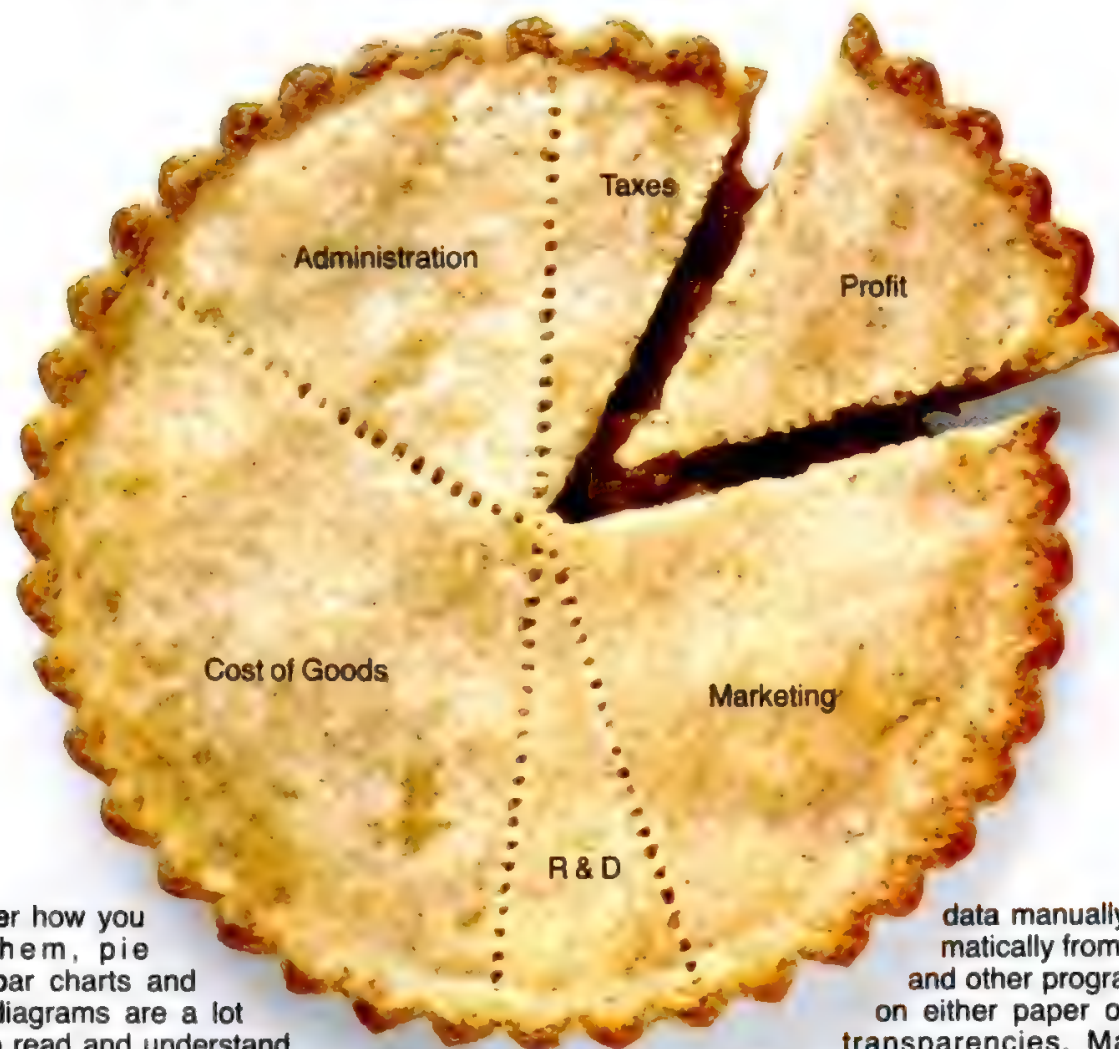


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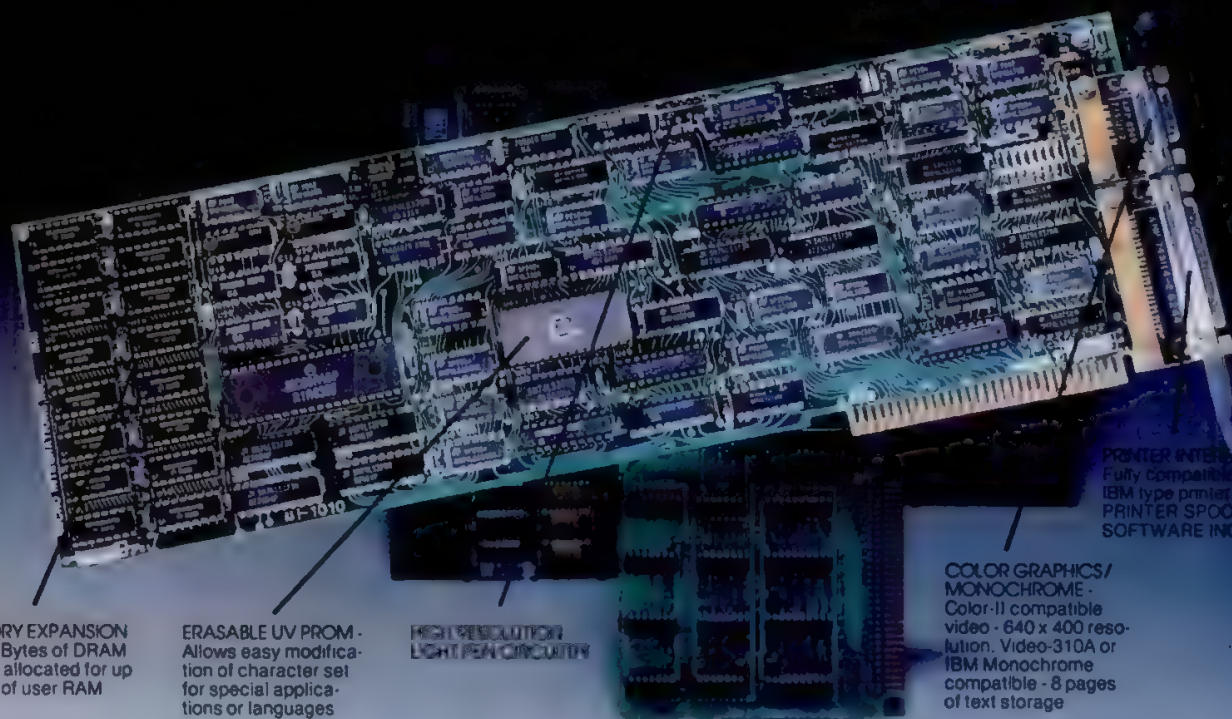
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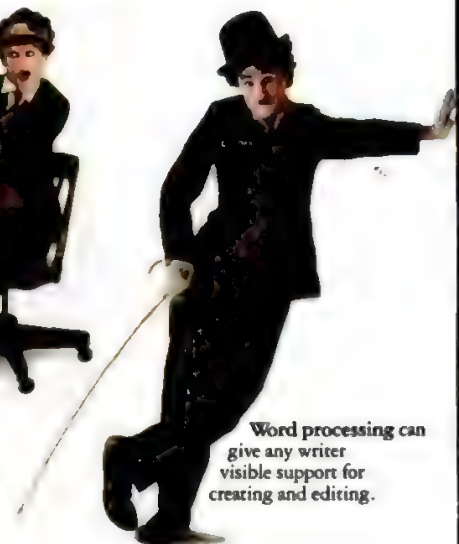
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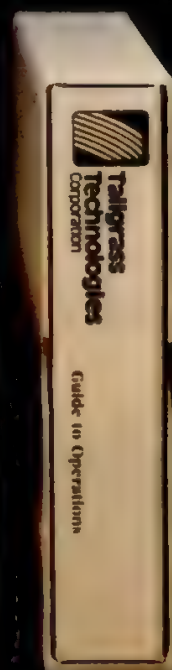
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I'm looking forward to our efforts to promote this as a product no business should be without.

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Greg Karraker
Sales Manager

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for 10-page report:
35 minutes.**

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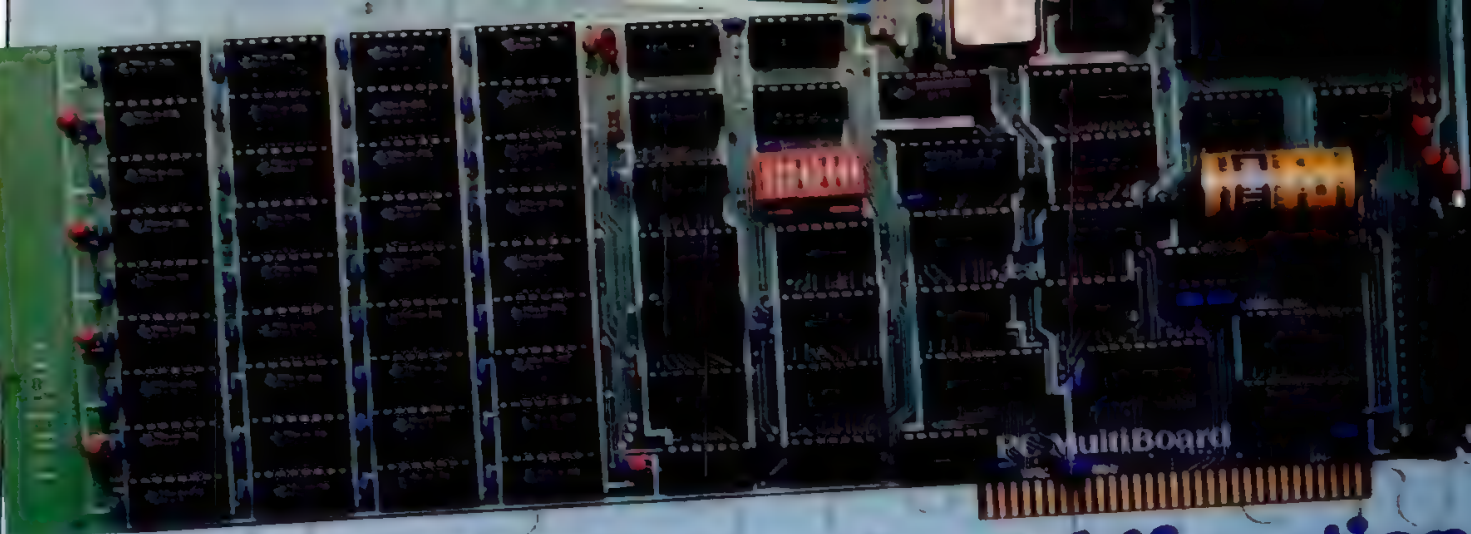
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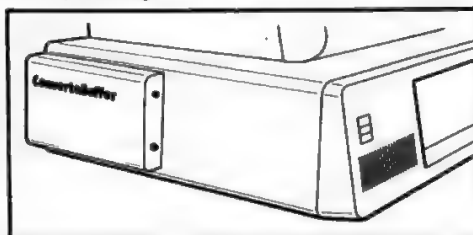


ConvertaBuffer™

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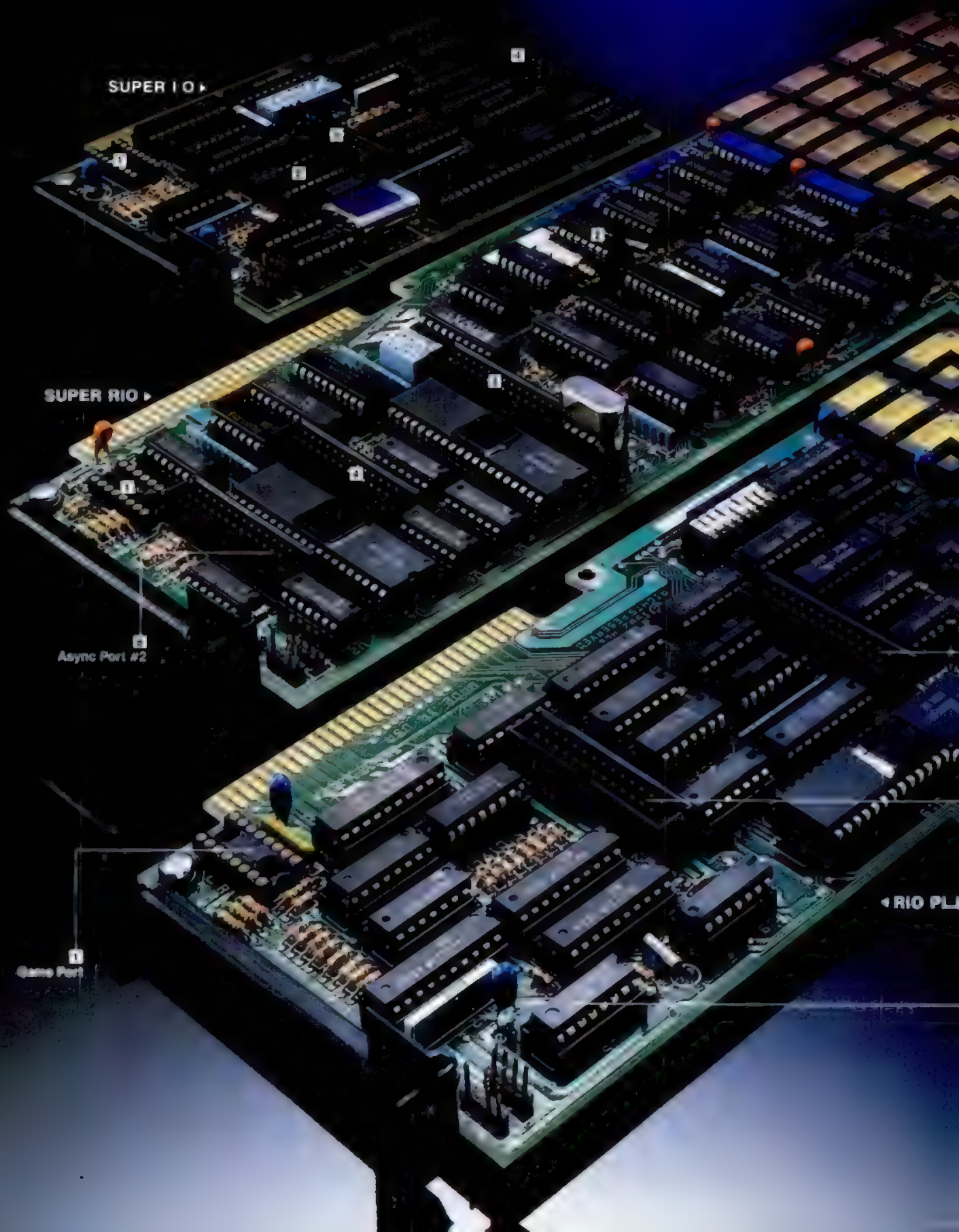
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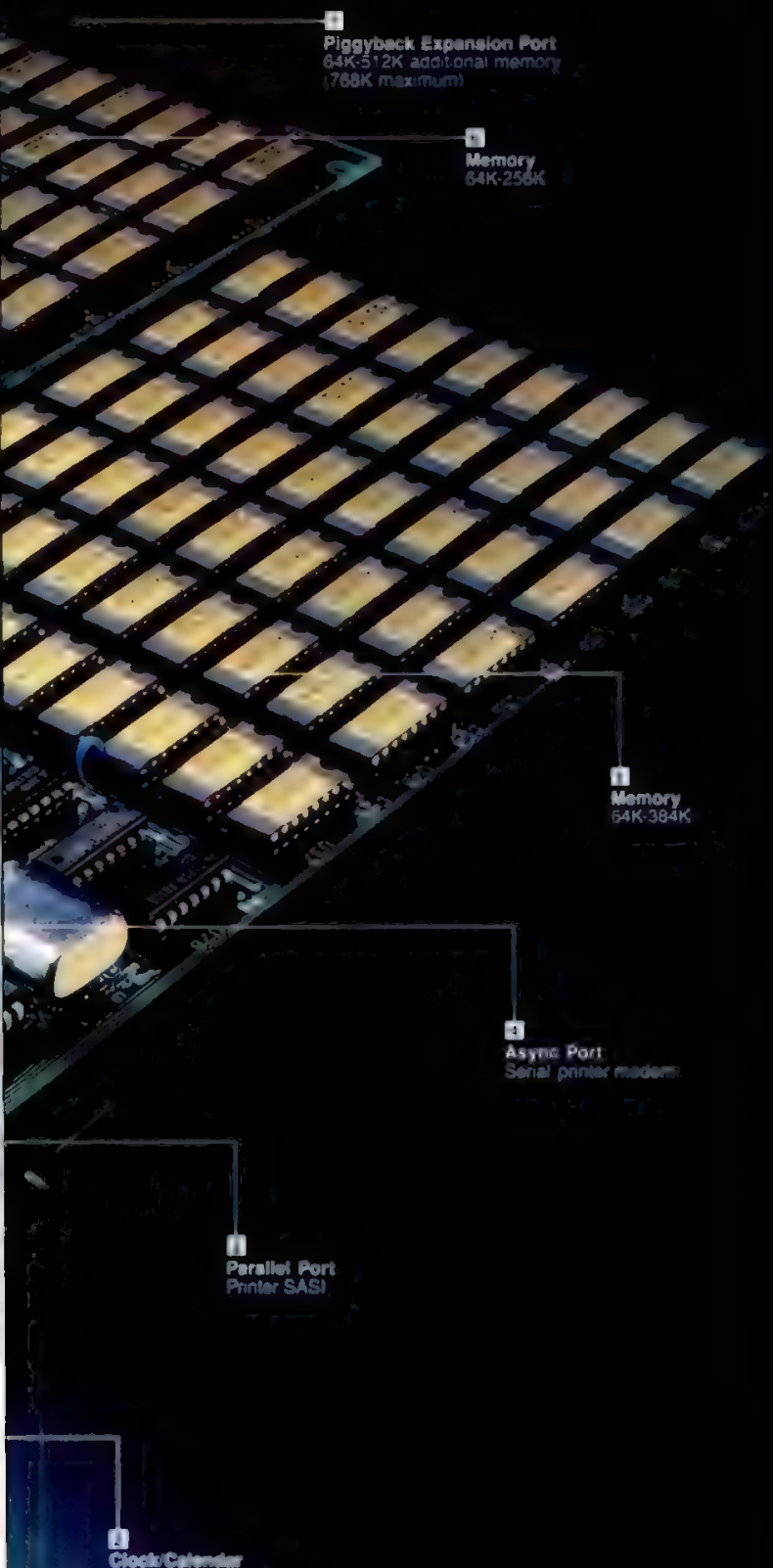
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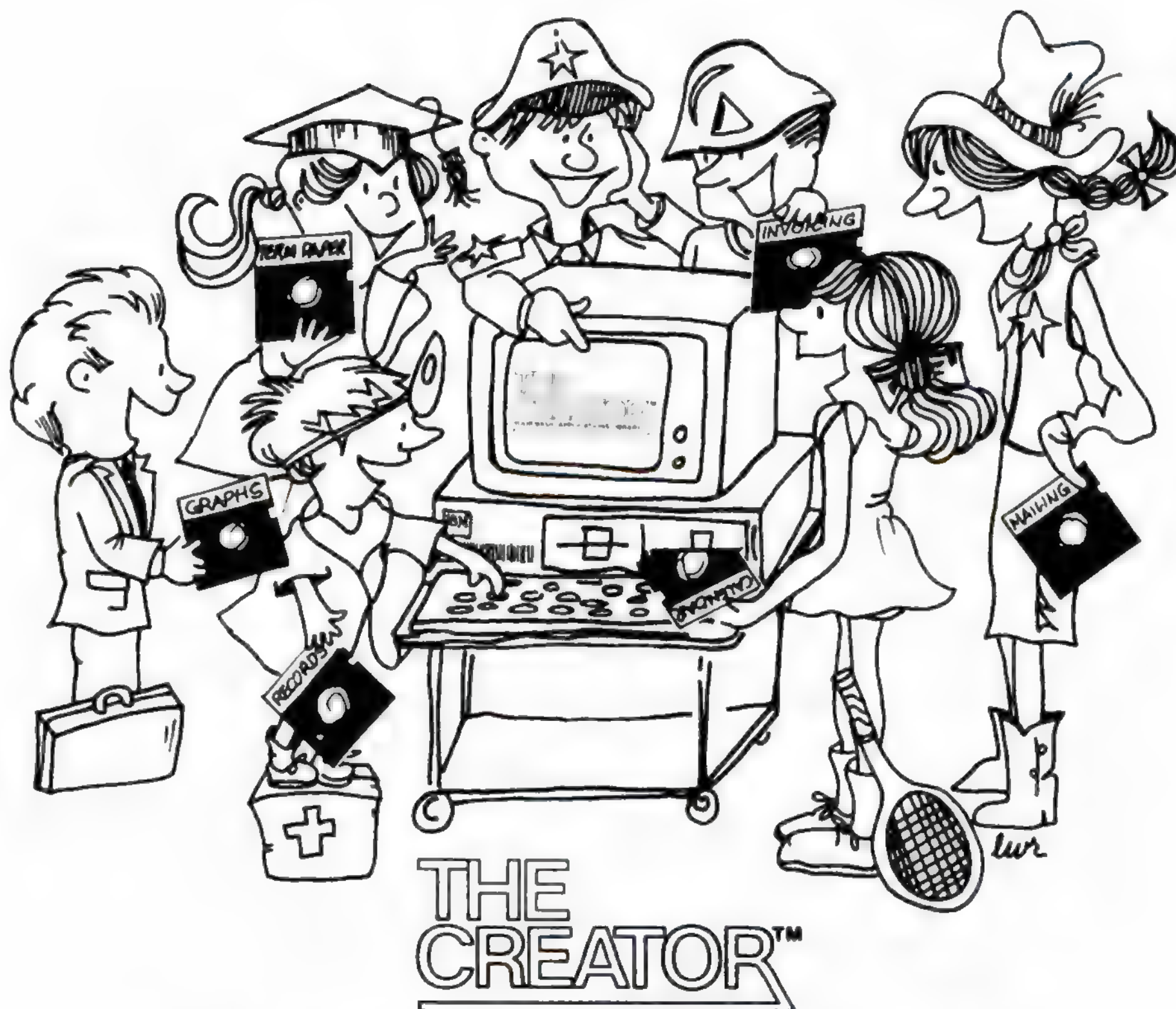
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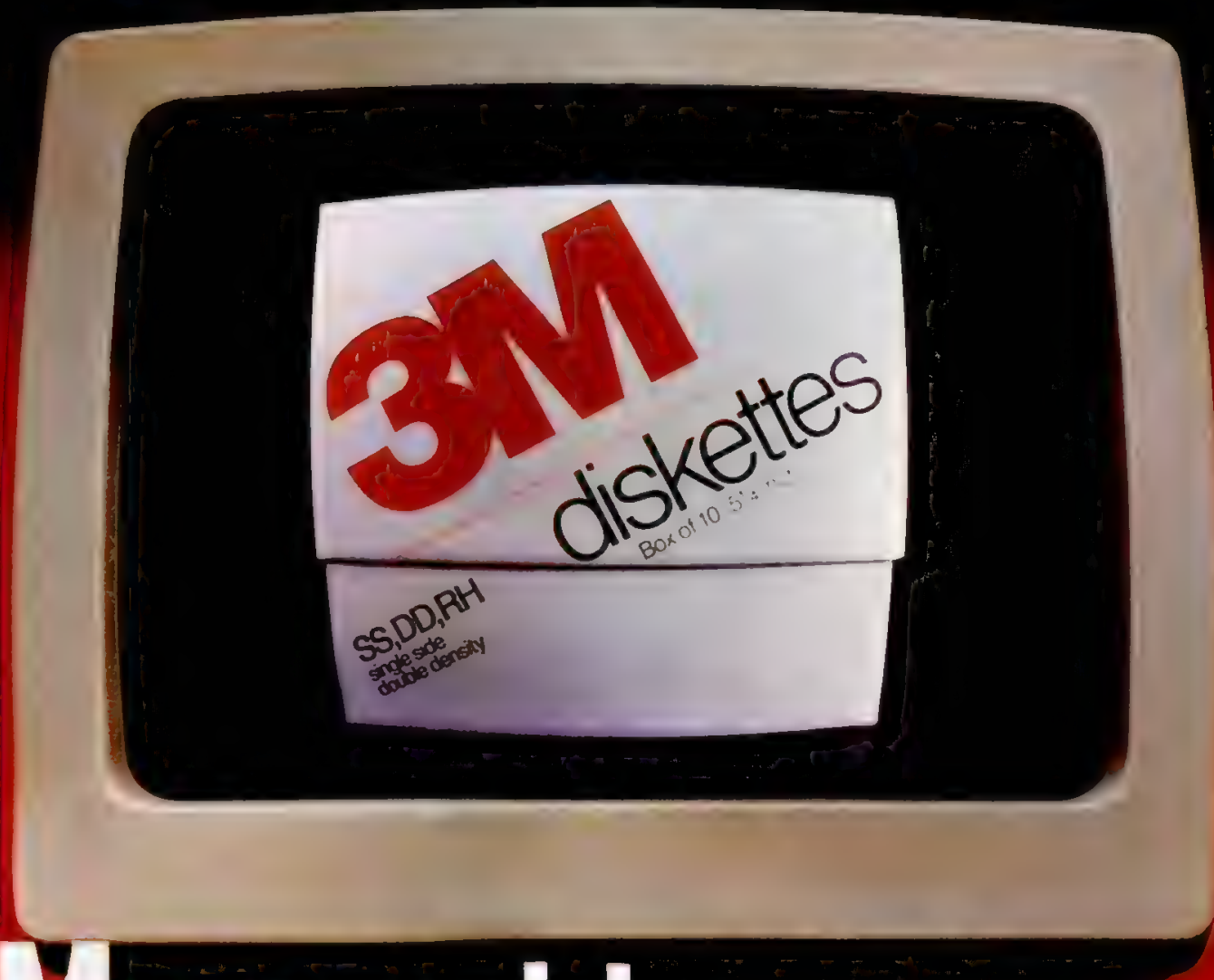
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Documenting An Infinite Number Of Monkeys

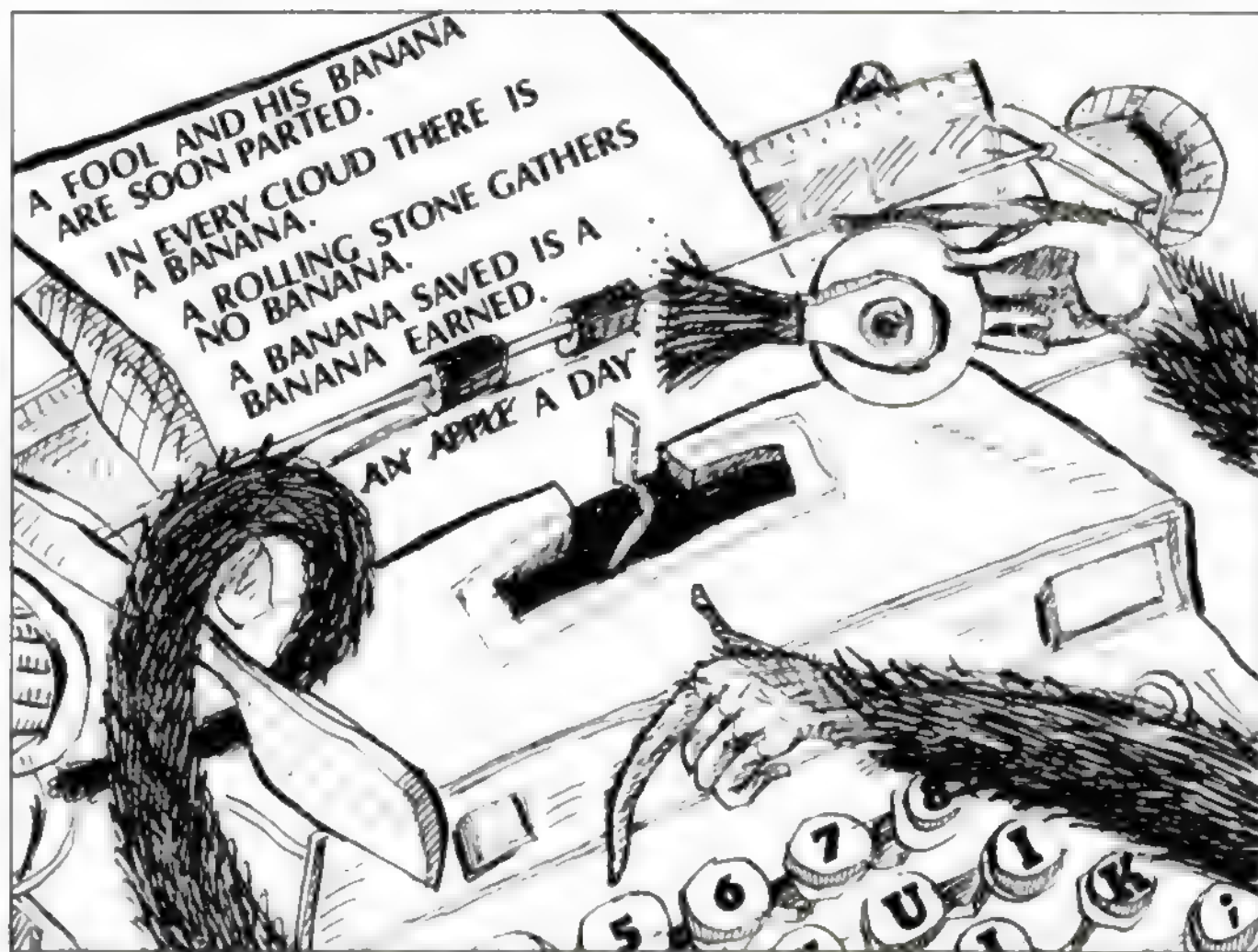
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Perhaps you haven't come across this ad, but you've surely encountered the end product. To adapt that most overused and unpleasant phrase, we are all too often victims of non-user-friendly "documentation." I think its authors are wrong from the very start: We would automatically be on friendlier territory if they'd start calling the things "manuals."

Writing a manual for a complex piece of work like a word processor or telecommunications program is considerably different from writing poetry, but there is still a fundamental need to communicate with the reader. Many of us who use microcomputers out of necessity have resorted to learning programs by experimentation: Just open the box, pop the disk in the drive, and explore. When all else fails, read the manual.

So how do these manuals get written? They sometimes make me think of Bob Newhart's classic comedy routine in which a scientist explains the theory of probability. It went something like this: If you put an infinite number of monkeys in front of an infinite number of typewriters



and let them peck away for an infinite period of time, sooner or later one of them will produce a great masterpiece of literature.

"Eureka!" yells the scientist as she grabs a sheet of paper from one of the simian typists. "Listen to this! 'To be, or not to be; that is the gzornnplatt.'"

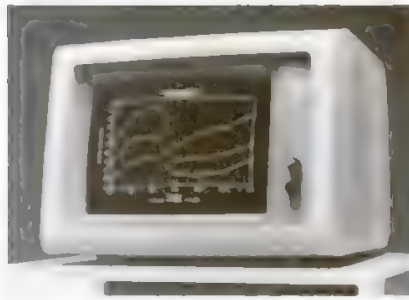
I thought I might offer a few translations of some of the most egregious paragraphs from manuals written for—or at—the PC user. All of the examples are real; only the names have been changed to protect the guilty.

FROM A MODEM MANUAL: The user has the ultimate responsibility to correct

problems arising from harmful radio-frequency emissions for equipment under his control. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference . . . All of these responsibilities and any others not mentioned are exclusively at the expense of the user.

TRANSLATION: Don't call us if your VisiCalc screen marches across your neighbor's Sony in the middle of the World Series. That's between you and the FCC. Fix it yourself.

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scientific characters. Call or write for more information.

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CIRCLE 261 ON READER SERVICE CARD

Most computer software that is available from the IBM Personal Computer is copyrighted, trademarked, and protected under the laws of the United States of America. There are numerous moral and financial issues which you should be aware of when using the . . . utility. . . .

TRANSLATION: Our lawyers made us run this.

JUST OPEN
the box, pop the disk in
the drive, and explore.
When all else fails, read
the manual.

FROM AN EXPENSIVE DATABASE PACKAGE: After our new manual went to print we found some typographical errors and we revised a few . . . commands. Enclosed are the corrected pages. Please insert them into this manual according to this substitution chart. Discard the old pages.

TRANSLATION: We didn't get around to proofreading the manual until we shipped the first 18,000 copies, so we received a couple hundred phone calls from users who said the program didn't work. We don't want to be bothered with inserting these new pages or reprinting the whole manual—what do you expect from a \$495 product?

FROM A "SIMPLE" DESKTOP MANAGER: String overflow—Seg XXXXXXXX P pp 0 oo indicates a system failure which is usually the result of hardware error. It can also be caused by a damaged database. If this error occurs you should record the name following "Seg," and the numbers which appear as pp and oo. You should then follow the procedures in section 20.2 and 20.1. If the problem can be reproduced with a new copy of . . . then you should communicate with technical support.

TRANSLATION: Hoo boy, do you have a problem! We sure hope it's in your computer and not our program. Check it out, will you? And thanks for beta-testing our product.

FROM A UTILITY PACKAGE: Print Spooler Module Update: If you try and run the spooler without having first created the Autoexec.Bat, the system will lock up and you must re-boot.

TRANSLATION: We call this an update so that you won't recognize that we made an horrendous mistake. And please tape this little slip of paper somewhere in the manual, would you? We couldn't be bothered to do it ourselves.

FROM A FAMOUS WORD PROCESSOR: *** FATAL ERROR F29: RENAME FAILURE, SYSTEM FAILURE, OR YOU CHANGED DISKS. These messages should not occur.

TRANSLATION: Go away son, you bother me.

Newhart, you were wrong. An infinite number of monkeys sitting at an infinite number of microcomputer keyboards couldn't write a great computer manual—merely the typical ones. Gzornplatt!

In Search of Literacy

This issue is devoted to shedding some light on the somewhat dreary state of training and education available to the PC user. PC's authors went back to school, studied the books, watched instant replays on videotape, and put a few manuals through a literacy test. The computer virgin continues his expedition into PC-land, opening the cartons, installing his computer, and using it as a word processor.

AN INFINITE
number of monkeys
sooner or later will
produce a great
masterpiece of
literature.

Moving on to some literature of recognized merit, I am proud that these pages include an interview with Pulitzer Prize winning playwright Marsha Norman, an IBM PC fan.

Is that the school bell I hear, or has your printer run out of paper again? /PC

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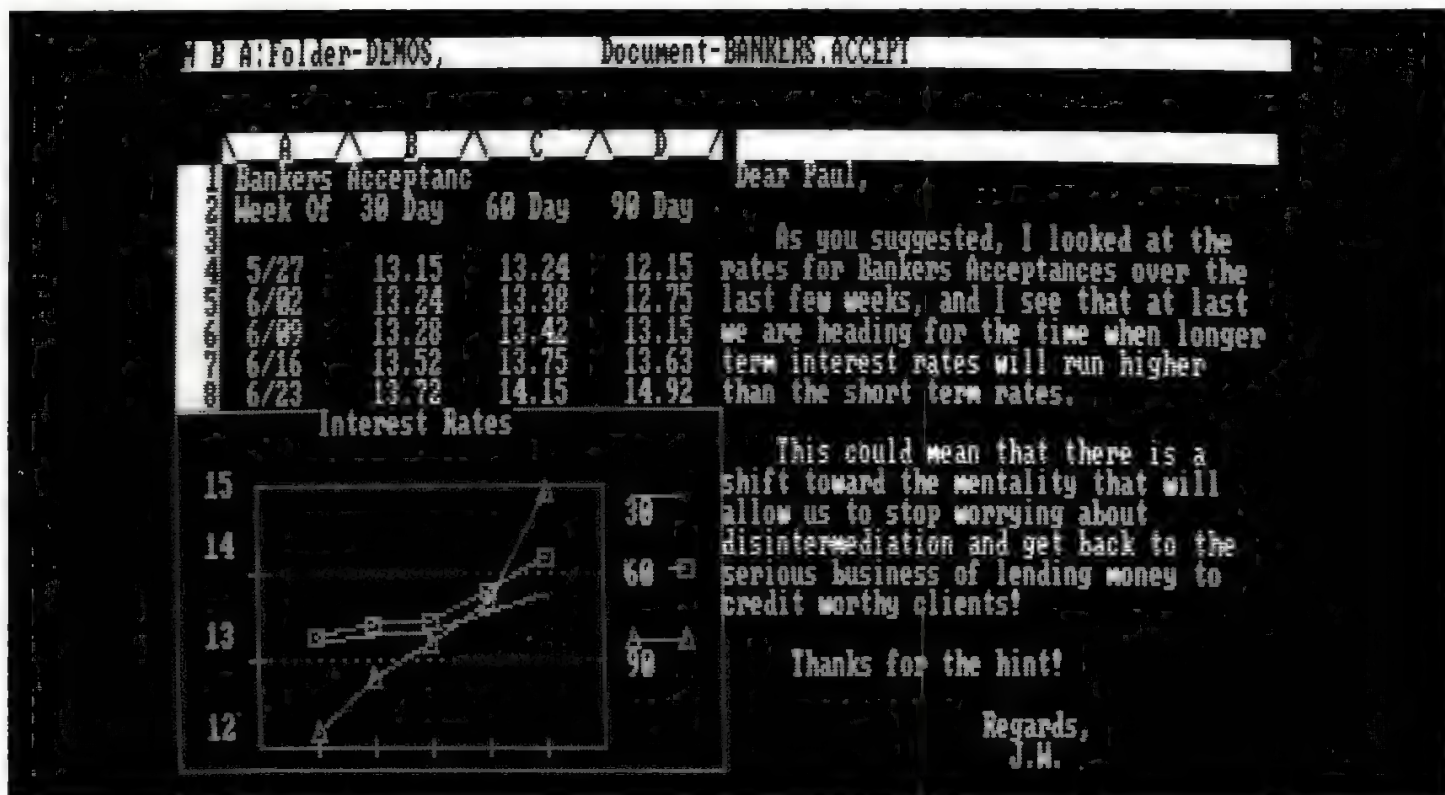
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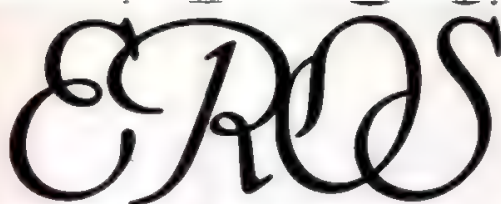
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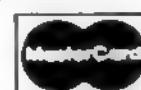
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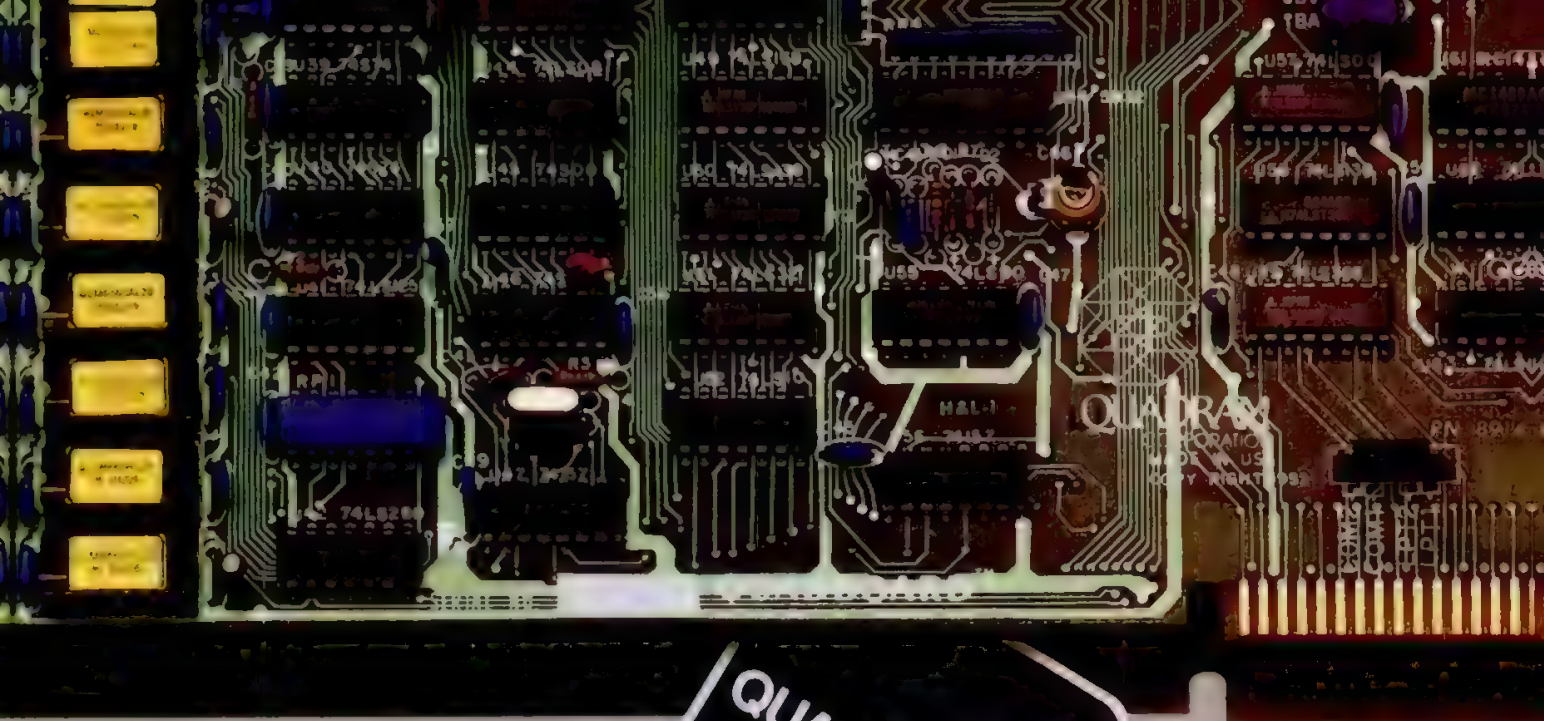
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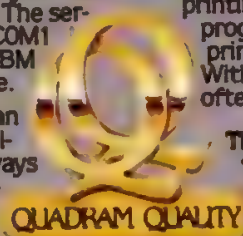
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Letters To PC

Hooray for the R, G, and B

I enjoyed the article on RGB monitors, (High Resolution Color Monitors," PC, Volume 2 Number 1), but have two quibbles, one minor and one major.

First, NTSC is usually rendered as "never twice the same color." Winn Rosch left out the word "twice." Second and more important, the article's sidebar names red, green, and blue as the three primary colors of light. As I recall from my kindergarten paint experiments, yellow is a primary color of light; green, through the magic of technology, is a primary color of video, and video only.

Keep up the good work. The magazine continues to improve and the artwork is a pleasure.

Robert G. Salter
New York, New York

Winn Rosch replies:

NTSC stands for either "never twice the same color" or "never the same color." Both are correct.

The red, yellow, and blue paints you remember from kindergarten were pigments. The primary colors of light are different: red, green, and blue.

In his article "High Resolution Color Monitors," Winn Rosch calculates the shadow mask pitch (dot pitch) for the IBM color monitor to be less than .375 mm. Yet the accompanying chart shows it to be .43 mm. Wherein lies the error?

Bill Kraengel, Jr.
Valley Stream, New York

Winn Rosch replies:

The dot pitch figure I calculated in the article was the largest pitch that would allow the display of a horizontal line of 640 separate dots on a 12-inch diagonal monitor. The chart reveals that several supposedly high-resolution monitors cannot resolve the quality that they claim to. In truth, although the IBM color monitor (and several others) can address a screen image with a resolution of 640 x 200 dots, it cannot display an im-

age with resolution that high. The result is not the inability to display a row of 80 characters across the screen, but the inability to display the individual dots of those characters and therefore a lack of sharpness of the screen image—which may or may not be acceptable to you. Only you can be the judge of that.



Help for the Confused

I think I can help others who, like me, are shopping for a personal computer. I have discovered what the phrase "IBM compatible" means.

Apparently, IBM compatible refers to anything from "We are currently being sued by IBM for patent infringement" to "If you look carefully, you will detect a faint resemblance between this machine and the IBM PC."

Glad to be of help.

Thomas J. Roberts
Storrs, Connecticut

Sexism Doesn't Sell

I look forward to each issue of PC Magazine. I have found the magazine very informative and quite interesting.

In Volume 2 Number 1, though, the art accompanying the article entitled "The TRS-80 Model 100: Never An Idle

Moment" was appalling. The pictures on pages 194 and 195 portray women as sex objects. On page 194, men in business suits are staring at a woman in a mini-skirt. On page 195, the same woman has an incredibly stupid, little-girl look on her face, apparently amazed at how smart the hot dog vendor is with his TRS-80. It's 1983 and times have changed!

Sexism won't sell magazines or TRS-80s to a woman in the computer industry (or any other industry, for that matter).

Adrienne Florence
Weston, Massachusetts

We meant no offense in our search for yet another way to take an interesting picture of a piece of metal, glass and silicon. Yours was the only letter we received about the illustration.—Ed.

Comments on Computer Art

Many thanks for the fine job you did on my work and on the Douat Permutations program ("Computer Art for Art's Sake," PC, Volume 1 Number 12).

I only have one small quibble, namely that I did not rediscover Douat's work myself. Professor E.H. Gombrich acknowledges in his book *The Sense Of Order* that Stuart Durant is the discoverer of the Douat work.

Mark Wilson
Cornwall, Connecticut

As one who has an article in press on Mandelbrot's fractal geometry (to appear in the *Two-Year College Mathematics Journal*, Mathematical Association of America), I was pleased to read Mark Wilson's acknowledgement of Benoit Mandelbrot's contribution to computer art. There are, however, two corrections which need to be made.

In the first place, I am certain that author Lindsay Van Gelder meant to say that Mandelbrot's fractal algorithms (not logarithms) were used to create special

Letters To PC

effects for *Star Trek II: The Wrath of Khan*. In the second place, even this corrected statement is not, strictly speaking, quite right.

The "fractal" sequence in *The Wrath of Khan* was generated by a technique developed by Loren Carpenter of Lucasfilm Ltd. in San Rafael, California. I place quotes around the word "fractal" because Mandelbrot is rather critical of Carpenter's approach, pointing out that the resolution attainable by the Carpenter algorithm is intrinsically limited. This limitation, says Mandelbrot, does not apply to his own algorithms. In all fairness to Carpenter, it should be pointed out that limited resolution is one of the trade-offs he made in attempting to devise a practical scheme for the generation of computer images. Carpenter notes that the typical framerate for the simulated mountain scenes averaged an hour and a half of computer time.

Those who are interested in Mandelbrot's work should consult his book, *The Fractal Geometry of Nature* (W.H. Freeman and Company, 1982), which is both an intellectual and visual treat.

Anthony Barcellos
Davis, California

Lindsay Van Gelder replies:

Barcellos is correct. I meant to say algorithms, and I regret the error.

Communications Breakdown

I was surprised to read in PC-Communiqué (PC, Volume 1 Number 6) the blanket statement that the software distributed by the New York Amateur Computer Club (NYACC) runs only on machines equipped with an 8080 board. While it is true that some of the earlier disks require this support, these disks make up just a fraction of the disks in our library.

As the communiqué in question points out, many of the earlier disks can be modified to run under PC-DOS. The library now includes 33 disks and is growing fast. Seventeen of the disks (#1 and #18-33) run under PC-DOS with no

modification. We are in the process of converting disks 2 through 6 and will be re-releasing them.

We believe in the widest possible dissemination of public domain software, and we appreciate your help in publicizing our program.

Donald C. Wiss
Secretary, NYACC
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Slash Those Zeroes

I was reading "Exercising ASCII" by John Schnell (PC, Volume 1 Number 12) and I noticed that in the programs listed, it was impossible to distinguish the letter O from the number 0. I found it very difficult to use the program because I had to stop programming every time there was an O or 0 to figure out which was indicated.

I suggest that if you continue to print program listings, you should find a way to differentiate between the two symbols. It is common practice to display the number zero with a slash through it when writing a program.

Robert H. Garretson III
Huntington Beach, California

Believe it or not, it's not easy to find a typeface with slashed zeros. Of course, we could hand-letter each copy, but. . .
—Ed.

Plus and Minus

Last year I bought *Home Accountant Plus*, a financial planning and record keeping program for my 64K RAM IBM PC. After many hours of grief setting up different budget configurations and getting inexplicable error messages, I took the program to the ComputerLand store where I bought it. They got the same results.

After much experimentation and several phone calls to the manufacturer, Continental Software, it was revealed that some copies of an earlier version of the program, for use with 128K, had

been accidentally released with instructions for 64K. I returned my disk to Continental for appropriate modification.

Now my program works with 64K, but when I tried to close out 1982 to prepare a data disk with the same categories for 1983, the program refused to close December 1982, giving instead directions for starting 1983. It then started 1983 with the month of December! Any attempt to move from December to January once again elicited the signal to start a new year. When I followed that instruction, 1984 appeared, beginning again with December. Catch 22.

Initially, I thought this program was well set up, and could really help with my fairly complicated household accounting. So far, however, virtually everything I have tried to do with it could have been done faster manually.

D. Douglas Peel
Newton Square, Pennsylvania

Curvfit Shapes Up

Thank you for publishing Winn Rosch's review of *Curvfit-3D* ("The Slightly Twisted Plot of *Curvfit-3D*," PC, Volume 1 Number 12). Many improvements have been made to the program over the version (1.0) that Rosch reviewed.

It is our policy to immediately address all reported bugs and send along a new copy of the corrected program at no charge. All bugs reported by Rosch in his review have been corrected. *Curvfit-3D*'s error-trapping facility has been enhanced as well, thus removing the likelihood of generating a fatal error during execution.

While the current retail price for *Curvfit-3D* is \$125, respondents to the article in PC can acquire it for the old price of \$90. All users of our software are encouraged to call to discuss problems or offer criticism.

Mark A. Herkommer
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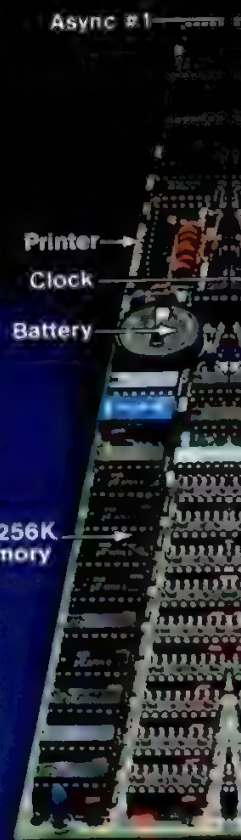
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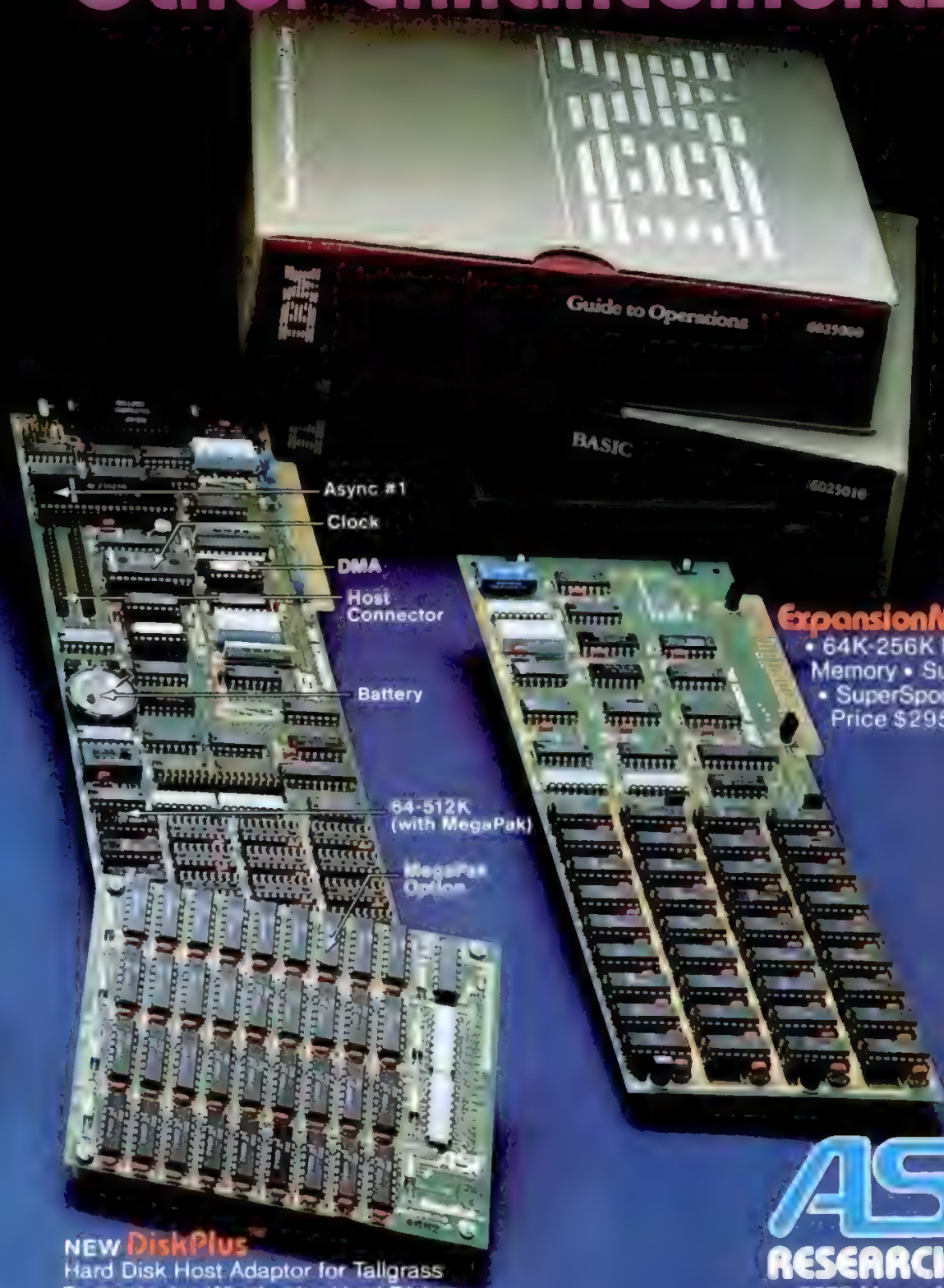


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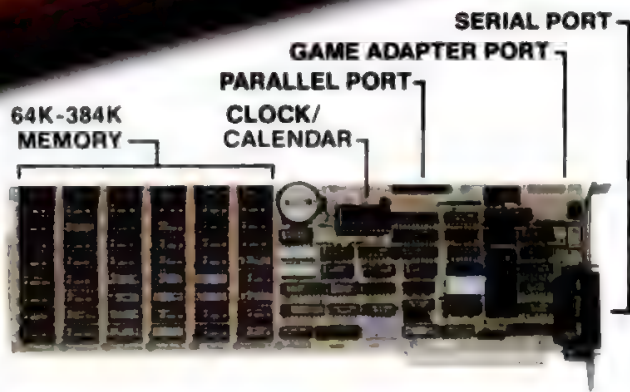
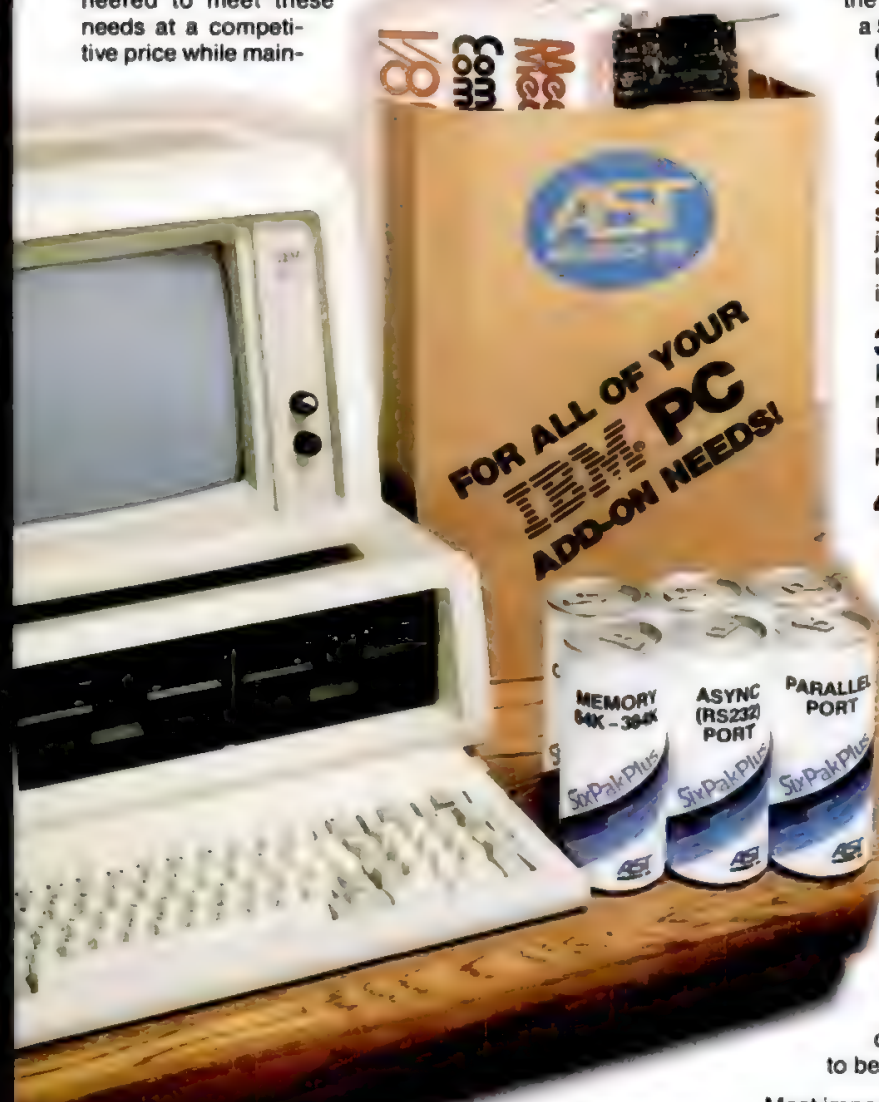
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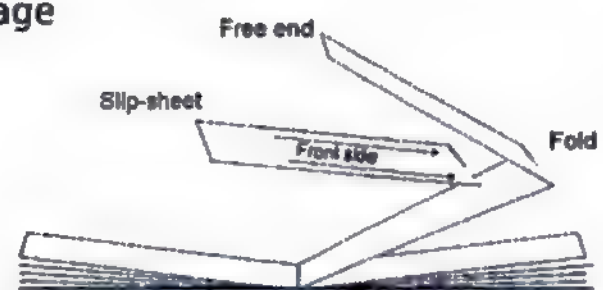
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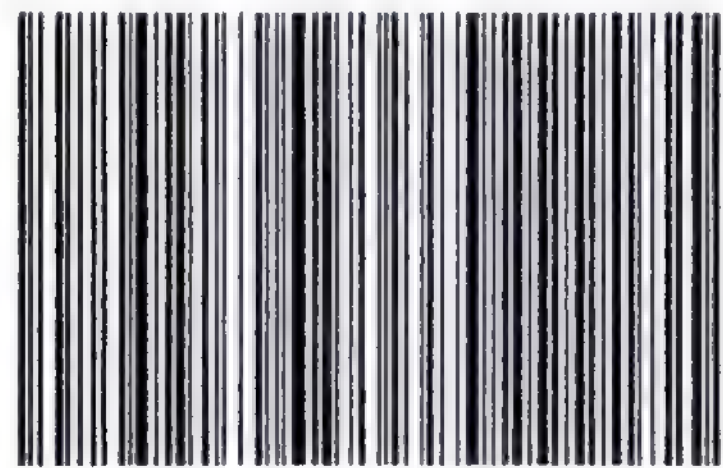
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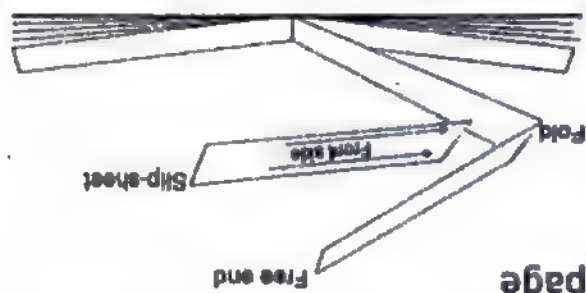
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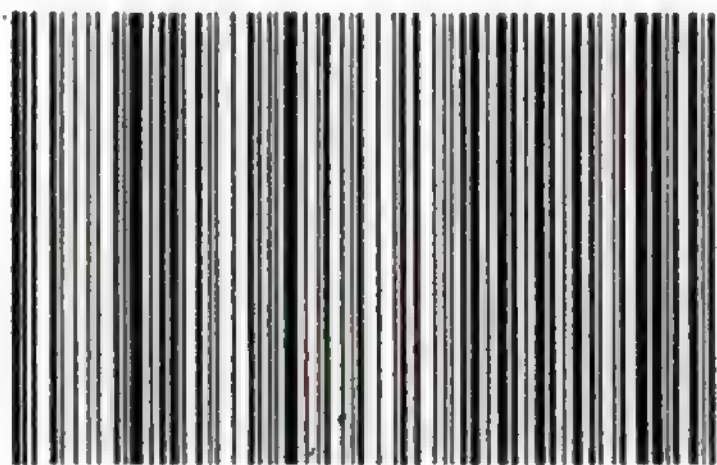
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The image displays three different multifunction cards from AST. The MegaPlus card is shown in the foreground, featuring various ports and components labeled. The I/O Plus II card is shown in the background, and the ConnectAll card is shown in the bottom right corner.

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Letters To PC

Look Out, WordStar

Your magazine is getting better by leaps and bounds with each issue. I read with particular interest two articles in Volume 2 Number 1. One was Corey Sandler's report on the reader survey, "Getting To Know You." The second was Stephen Manes's review of the revised WordStar, "WordStar 3.24 and 3.3: MicroPro Does It Again . . . And Again."

I feel very fortunate that I never purchased WordStar, from what I hear about it. Manes's article was followed by an article on how to fix up a bad goof, "Fast Recovery From WordStar Disaster." It is difficult to understand how anyone can like a piece of software with so many problems.

The word processing software I use, EasyWriter II and EasySpeller, costs less than WordStar, SpellStar, and Mail-Merge. As far as I can tell, EasyWriter II and EasySpeller do all that WordStar does and probably more. There are still a few minor things IUS might do to improve EasyWriter, but as I read Manes' article I began to feel more and more fortunate.

Clifton E.R. Lawson
Oregon, Wisconsin

On many occasions I have read comments sent in to PC about word processing programs such as WordStar, Volkswriter, Versatext, and EasyWriter I and II. I would like to present my views on a new word processing program that has not been given much attention.

I am a computer novice and had been looking for a word processing program since I purchased my computer. My first step was to scan the ads in PC to find word processing programs that I could try out. I tried several, but the most user-friendly of all was Wordvision by Jim Edlin.

The program is not complete; I received what is called a pioneer's version. If, as the publisher admits, the existing program contains just a small sample of

what the finished product will contain, then WordStar beware!

Gary B. Kendrick
Chattanooga, Tennessee

Don't Trade On Safety

In his article, "Trading Secrets" (PC, Volume 1 Number 10), Daniel Remer recommends following advice contained in James Pooley's Trade Secrets in order to stay out of trouble.

However, "requiring vendors to ship raw materials or chemicals in plain, coded containers with no indication of contents or suppliers" might protect secrets but eliminates protection of the individuals who may come into contact with these substances during shipment and handling.

What if Remer's hypothetical entrepreneurs, Johnson and Atkins, take Pooley's advice? Assume they set up shop in one of the increasing number of states and/or local municipalities with "worker right to know" laws on the books. This is a likely scenario, since one of these laws exists in California as the newly enacted "Hazardous Substances Information and Training Act." Assume, then, that the two locate the business in the heart of California's Silicon Valley, thus also coming under the jurisdiction of Santa Clara County's "Model Ordinance."

A truck containing substances amply protected by plain brown wrappers and codes backs up to the loading dock of the Johnson/Atkins facility. As one of their forklift trucks maneuvers the load, the operator turns too sharply. The unmarked containers spill off the truck, hit the concrete loading dock, and break open. What happens next? The codes have been obliterated by the spilled substances. Who is the supplier? Who is the manufacturer? What is the stuff? What can it do to people and materials in the short run or over time? How does it interact with water, solvents, or other cleanup materials?

If the forklift operator mops up the mess and finds his skin covered with severe chemical burns in a matter of hours, Johnson/Atkins has little "protection" from a nasty suit for failure to provide information regarding the hazards, controls, and emergency measures associated with a hazardous substance. As the IRS often quotes, "Ignorance of the law is no defense!"

The consequences for a small company like Johnson/Atkins can be financially devastating. Consider the bankruptcy proceedings of large, healthy Manville corporation based on projected future settlements from suits for "withholding" information regarding hazards of asbestos. Or keep in mind the recent award of just under \$5 million to plaintiffs who convinced the California jury that the defendant company had not informed them of possible sterility and infertility associated with use of the chemical DBCP.

Before taking Remer or Pooley's advice, remember the consequences of failure to comply with the law.

Muriel Akamatsu, Ed.D
Program Management in Occupational
Health and Safety
Oakland, California

Daniel Remer replies:
I think Muriel Akamatsu raises an interesting and valuable point. Clearly no one should put others' health and safety in jeopardy in the interest of protecting trade secrets. I agree that compliance with the law and common sense should take precedence.

Friendlier Finances

The two articles about personal and home finance programs for the IBM PC ("Personal Finance Programs For The Personal Computer" and "Five Financial Programs For The Home," PC, Volume 1 Number 10) failed to mention what I consider the friendliest and fastest personal financial program, Personal Fi-

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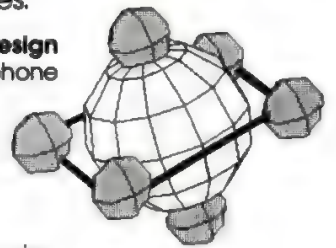
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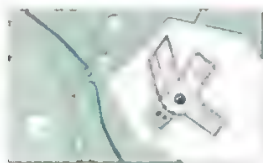
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I have also followed through on the modifications you requested regarding the floor plan and the structure's relation to the river. It was a fairly simple process to make the changes with our 3Design package and I think you will be quite pleased with the results.



This building design provides a special experience with an architecturally pleasing shopping atmosphere. It will easily fulfill your needs for efficient use of space and affordability of construction without compromising structural grace and beauty. The 3Design images I developed this afternoon clearly point this out.



page 2

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Letters To PC

nance Master by Spectrum Software.

Personal Finance Master sells for only \$75 and easily outdistances most of the programs reviewed in the two articles when it comes to speed and simplicity, while retaining all the features of the other programs. In addition, it keeps track of addresses and prints them on checks automatically. This is a real time-saver when I am paying the monthly bills.

Editing transactions is fast and easy, and there is no faster program for reconciling a bank statement. A real bonus is that what you see on the screen or on a printout looks like a real checkbook.

As far as I am concerned, you missed one of the best programs available for home accounting.

Charles A. Coakwell, III
Mayfield Heights, Ohio

Sex and the Single Computer

I would like to take partial exception to the findings of the National Institute of Occupational Safety and Health (PC-Communiqués, Volume 1 Number 12).

Your IBM PC probably won't make you sterile, but it surely cuts down the time available for sex. I guess the result isn't all that different.

Wm. B. Sweet
Rio de Janeiro, Brazil

A Company That Cares

Much has been written about hardware and software support, and I would like to add a few words about my experiences. About 6 months ago I purchased an ABM Omni Board with a serial port, clock, printer port, and game adapter for my IBM PC. The game adapter was advertised as capable of working with up to two Apple joysticks.

Recently, I finally bought one Apple-compatible joystick and hoped to play some games on my PC. Much to my dismay, the joystick buttons didn't work properly with the software I had pur-

chased. After only one phone call and one letter, ABM fixed the bug by sending me a terminator plug for the phantom second joystick.

The company understood the problem and solved it quickly, at no cost to me. I want to recommend ABM's products and support to your readers. Service and support are not a matter of local dealers or mail order houses, but of finding good people, with expertise, who care enough to help.

Ken Topolinski
Arlington Heights, Illinois

Drowning in Books

Book excerpts are fine, but there is a real need for a regular book review section or column in PC. At last count, our local computer bookstore had 17 volumes devoted to the IBM PC, with the store claimed, "at least another dozen titles on their way!"

Singly or in batches, review 'em all!

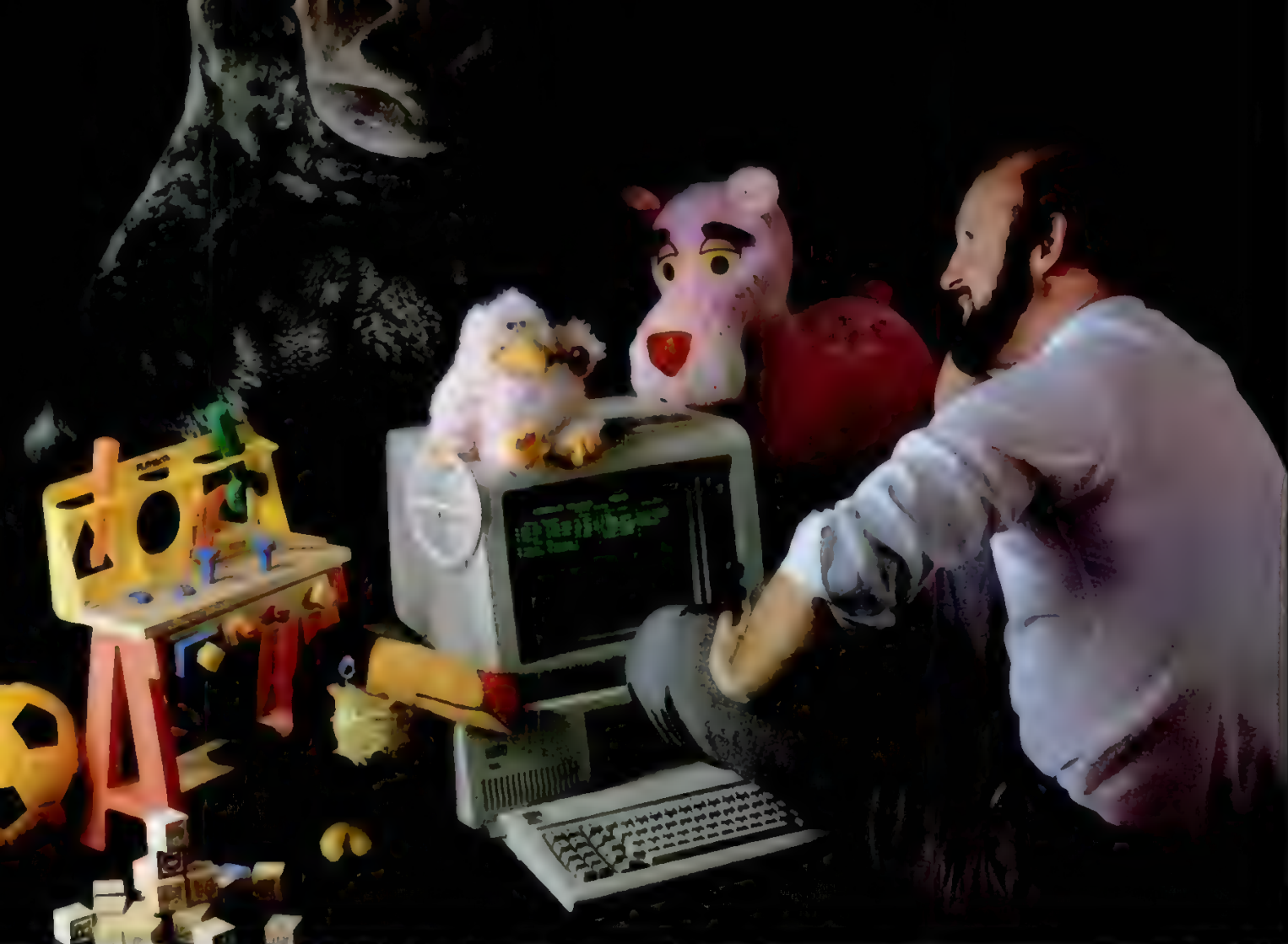
J.A. Du Lac
San Francisco, California

RPG II, Where Are You?

I have been searching for information on the possible development of an RPG II compiler for the PC. I have read countless computer journals, including Volume 1 Numbers 3 through 12 of PC Magazine, and have found only one brief mention of such an animal. Why the lack of information? Is there some reason the language I have been using on IBM System 3s, 32s, and 34s for the past 8 years does not lend itself to the IBM PC?

Rick Manning
Pine Bluff, Arkansas

There is no reason we know of why RPG II (a general purpose programming and reporting language that works on the basis of setting switches) should not be operable on the PC. We have seen RPG II on a CP/M machine, but not yet on our favorite computer. Anyone out there with the inside scoop?—Ed.



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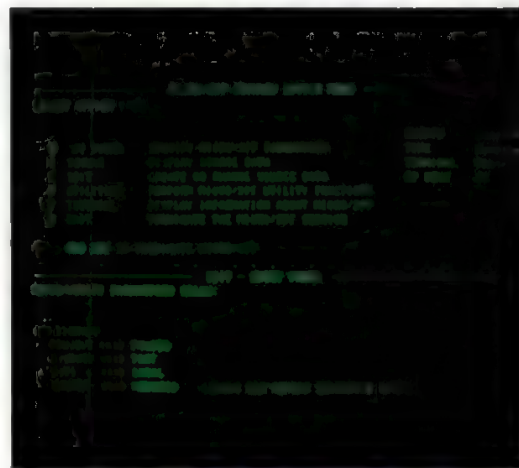
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CIRCLE 377 ON READER SERVICE CARD

Letters

In Defense of Paradise

I am very disappointed in the editorial policies of PC Magazine that permit the publication of an article containing a sentence such as the one in Paul Somerson's "Dialing for Dullards." (Volume 2 Number 1, page 438) To wit: "Interesting philosophy here: present one and only one fact to the user at a time, as if comprehending more were out of the question. You can tell without looking at the label that this was made in California."

If others in California feel as I do, you might consider publishing an apology and amending your editorial policies to avoid further such affronts.

Lawrence A. Harvey
San Diego, California

Paul Somerson wanted to reply to your objection, but we were afraid he would offend Jersey or Texas or . . . You were not the only one who took issue with the passage in question. Several PC editors are recently transplanted Californians, and they remain exceedingly loyal to their home state. At least one confronted Somerson about the passage while the article was still in manuscript, but to no avail. You know how unreasonable those New Yorkers can be.—Ed

Legal Matter

On behalf of my user's group, and all PC user's groups for that matter, I ask that you address a question. What program listings in your magazine may we legally copy for distribution? Our club is a not-for-profit organization which has developed a growing library of public domain software. We copy only those programs and games which are in the public domain onto disks and sell them to our members to raise funds for our poor treasury. We also trade software with other PC user's groups around the country.

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Letters

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Corrections

The captions for the photos of the Hewlett-Packard 7470A Plotter and the Houston Instruments HiPlot DMP-40 ("Two Computerized Draftsmen," PC, Volume 2 Number 1) were inadvertently reversed. The Houston Instruments plotter appears on page 289, and the Hewlett-Packard plotter on page 288.

The correct price for the Micro UPS, 400 VA model, manufactured by Topaz Inc. (New On The Market, page 596, PC, Volume 2 Number 1), is \$695.

The figure appearing on page 420, Volume 2 Number 1, is part of the article "A Fast Recovery From WordStar Disaster."

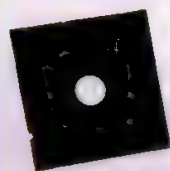
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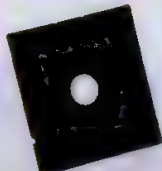


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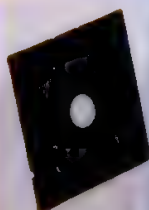
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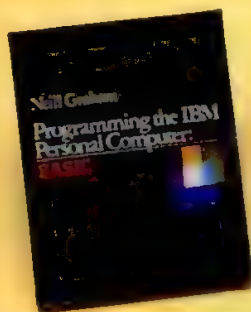
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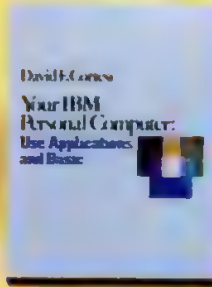
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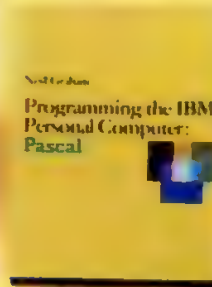
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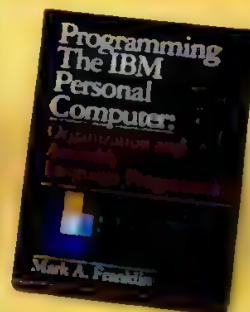
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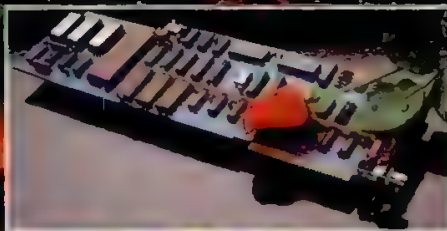
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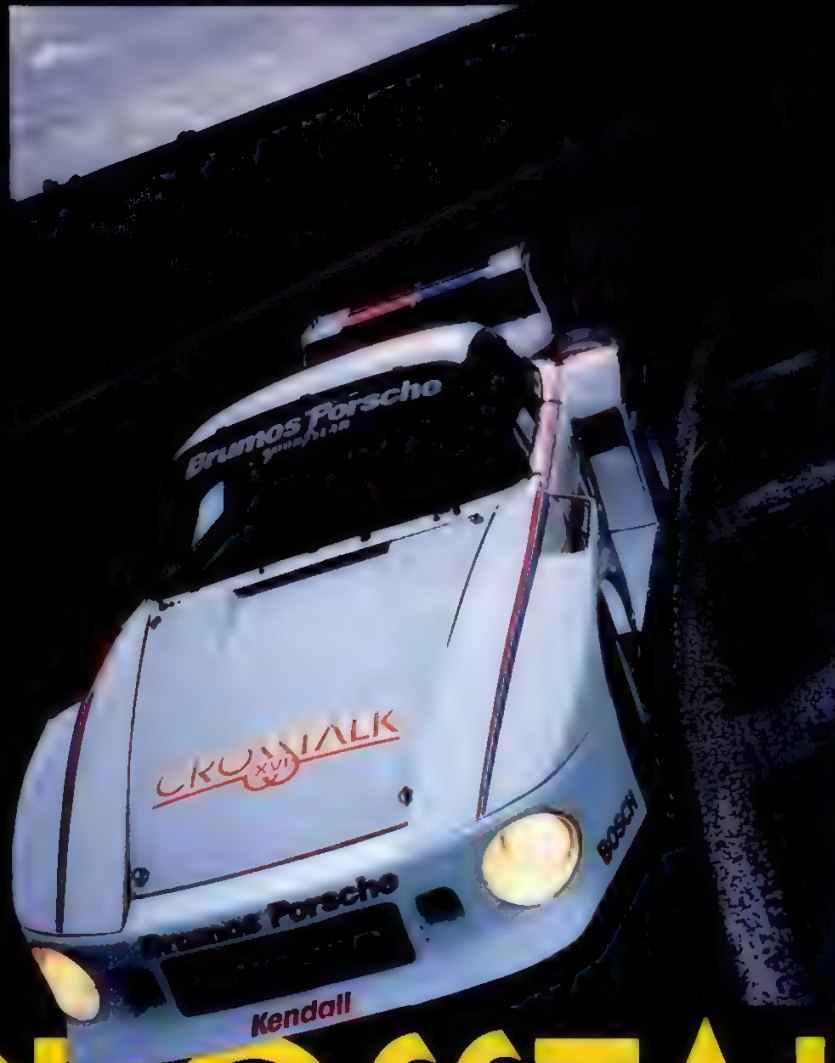
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The GSA's D.C. PC PX

The federal government's General Services Administration (GSA) is gearing up to open a chain of stores that will sell microcomputers to federal agencies at a significant discount. The GSA has asked several computer vendors to bid on operating a pilot store in Washington, D.C.; the bidders must be able to provide training and be ready to expand nationwide on 90 days' notice.

The GSA will sweeten the deal by providing the winning vendor with a rent-free location and a guarantee that if federal agencies spend less than \$100,000 in the store each year, Uncle Sugar will dig deep down

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The GSA, after listening to this and other objections to its plan, is proceeding with the pilot store anyway; the winning bid will be announced in August. NACS has responded by organizing its members into chapters to lobby against further federally favored stores opening in other cities.

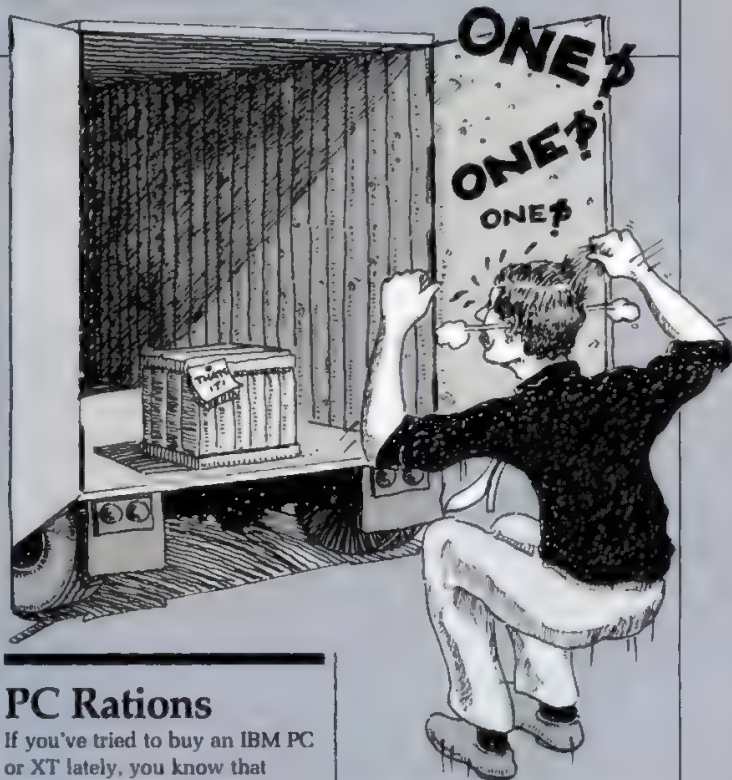
PC Success Stories

In the rapidly changing computer field, most of the news we hear is about the latest products, the most experimental applications, and the questions and problems that follow in their wake. Sometimes it seems that there's nothing going on between the points of anticipation and obsolescence.

Within this whirlpool of activity, some good must come from computers. Somebody out there must be using a PC to do a necessary task—and it does the job very well, thank you. But we hear about it only 8.3 percent of the time. When a computer works dependably, it gets taken for granted.

November is the month of Thanksgiving. In the spirit of that holiday, PC invites readers to reveal the reasons they've found to be thankful . . . for their computers. If a PC has made your work easier and your life more enjoyable in some way, please tell us how. The November issue of PC may include your experience in a selection of "PC Success Stories."

Please send your good news to: PC Success Stories, PC Magazine, One Park Avenue, New York, NY 10016.



PC Rations

If you've tried to buy an IBM PC or XT lately, you know that there's a shortage of these popular machines. IBM's production hasn't caught up with the orders placed at its expanded network of outlets selling personal computers.

The dealers were first told that they would receive an allocation of only 65 percent of the machines they'd ordered. In many cases, dealers were sent only 25 percent of what they had asked for. Now IBM advises that a customer will have to wait up to 6 weeks for a PC to arrive at an IBM Product Center. It could even take 6 months if the order was placed at a branch sales office.

This should be a great season for diversified dealers who can deliver other IBM-compatible systems to their customers without delay. While confidence in the IBM name has attracted many new buyers to the microcomputer marketplace, easy availability will make machines with unfamiliar names seem more appealing.

Update to WordStar Update

MicroPro recently announced that registered users of WordStar, MailMerge, and SpellStar who wish to upgrade to the new 3.3 versions must consult their dealers rather than the manufacturer, despite what was previously announced (see "WordStar 3.24 And 3.3: MicroPro Does It Again . . . And Again" PC, Volume 2 Number 1). Upgrades for each of the three programs will normally cost \$85, but users who bought earlier versions after April 1, 1983 will receive the new ones free on showing proof of purchase.

As the buck gets passed to the dealers once again, we wonder what use MicroPro ever intends to make of its file of user registration cards.

—Stephen Manes

PC-Communiqués



Computer Culture

If you've never looked at your PC with the same awe as you would an ancient dinosaur bone or a painting of haystacks by Monet, there are now museums that may change your point of view.

The 4-year-old Computer Museum, located in Digital Equipment Corp's Marlboro, Massachusetts headquarters, traces computer technology from the birth of the abacus through the maturity of the silicon chip. Some significant hardware from the computer's history is on display, including the 96-ton ENIAC IV and one of the few Apple I machines to survive the rebate program following the introduction of the Apple II.

Admission to the Computer Museum is free. It is open Sunday through Friday from 1 to 6 p.m. until November; that month the museum will close its doors while moving to larger quarters on Boston's Museum Wharf. Until then, it's located at One Iron Way, Marlboro, MA 01752, and can be called at (617) 467-4036.

Computers have gained access to art museums this year as well. You may recall the terminals and white plaster human figures that graced the *Time* magazine cover as a tribute to the "Machine of the Year." That sculpture was the work of George Segal, whose life-size plaster cast works have been exhibited around the world. His personal computer tableau has been on display at the Radio Shack Computer Center in Fort Worth, Texas. This October it will appear at the Boston Museum of Science, then be



Stop the Presses!

We received a press release with the following headline:

"NUMBER OF MINICOMPUTERS & MICROCOMPUTERS CONTINUES TO INCREASE ACCORDING TO REPORT BY EXPERTS."

These same experts must also have the inside line on John Paul II's religious preference and the occupancy of Grant's Tomb.

This Land Is My Land

ComputerLand, the national microcomputer retailer, has filed suit against SoftwareLand, which opened three stores this June in the Southwest. The party of the first part claims that the party of the second part infringed upon its trademark by using the suffix "land" in its name.

We wonder if Disney Corp.'s lawyers in Anaheim plan to take action against the lot of them—or would that be too Mickey Mouse?

displayed at the Chicago Museum of Contemporary Art; the sculpture may come to cultural centers in other cities as well.

The Eagle Weeps

The microcomputer community was stunned by the sudden death of Dennis Barnhart, the 40-year-old president and C.E.O. of Eagle Computer, Inc. On June 8, 1983 Barnhart lost control of his red Ferrari, broke through a guard rail, and crashed into a ravine only a block from the company's Los Gatos, California headquarters.

Barnhart's accident occurred on the day Eagle made its first public offering of stock at \$13 a share. At the news of the president's death, Eagle executives halted sale of the stock and reorganized the company's leadership according to the contingency plan.

Charles Kappenham, Eagle Computer's founder, succeeded Barnhart as C.E.O.; Ronald Mickwee, formerly an executive vice president, stepped in as the company's president. After a week delay, Eagle offered its stock on June 15 at an opening price of \$12. In a few days all 2.75 million shares had sold out.

Despite the blow of Barnhart's death, investors seem confident in the continued growth of the company he helped build. The Eagle will continue to fly.

Sprechen Sie PC

IBM officially introduced its PC to Germany on January 19, 1983. *Computer Persönlich* magazine evaluated the machine in March and gave it a "nein."

What went wrong when crossing the Rhine? First, it seems that IBM's development team neglected to take into account that Germany uses the DIN standard to represent characters. DIN characters have only 7 bits, so the last bit of the PC's 8-bit character is dropped when used in most German applications. For example, most German printers can't generate umlauts when run from WordStar on the PC. *Computer Persönlich* recommended that IBM change the keyboard decoder, the BIOS ROM, and the character generators to better suit the German language.

The reviewers also complained that the PC's manuals were so badly translated as to be nearly incomprehensible. They suspected that the job on the PC-DOS manual has been done by a nonprogrammer. In response, IBM has promised to rework and re-edit its documentation.

While IBM goes back to its language labs, several manufacturers of PC-compatible systems are already making their marks in Germany.



Don't Get Burned!

Does a ghostly maze loom ominously on the screen as you type your latest novel? Can you see the BASIC function key assignments even when your machine is turned off? Bad news: Your monitor is a victim of an irreversible malady—phosphor burn or etching.

Like many workaholics, the friendly phosphors on your screen eventually get "burned out." When not lit up, they leave behind an irritating "etched" image. A lot

of PC screens are already starting to show these scars.

Inverse video is the worst culprit. The most intense etching we've seen has been on screens used to run spreadsheets with inverse-video headings or word processing programs that keep line 25 burning with a status message.

Don't expect help from IBM. The company calls screen etching "a function of use" and won't cover it under its warranty or service agreements.

This is slightly disingenuous, considering that there's no warning in the *Guide to Operations* and that IBM has

made inverse video status lines a virtually universal feature of the programs it markets. If you're covered by a service agreement and your present monitor goes bad in a way IBM does consider its fault, you should refuse to accept a replacement that shows the slightest evidence of etching.

To prevent the problem, you could switch to an Apple Lisa or another computer that spares the phosphors by blanking the display after about 5 minutes of inactivity. But if you're stuck on your PC, keep the monitor's brightness and contrast controls at the absolute minimum level you need to work comfortably. Turn the monitor off, or at least turn the brightness down, when you step away from the PC for any extended period; just remember that the

computer is still on. Avoid inverse-video status lines if at all possible. If you've got a color monitor or TV set, change the border and background colors now and then.

"C'mon, Dad!" hypnotized kids whined in the days of the first video games as they pleaded for 10 more minutes of playing a home Pong-alike. "It's not gonna mess up the TV!"

As usual, Dad was right.

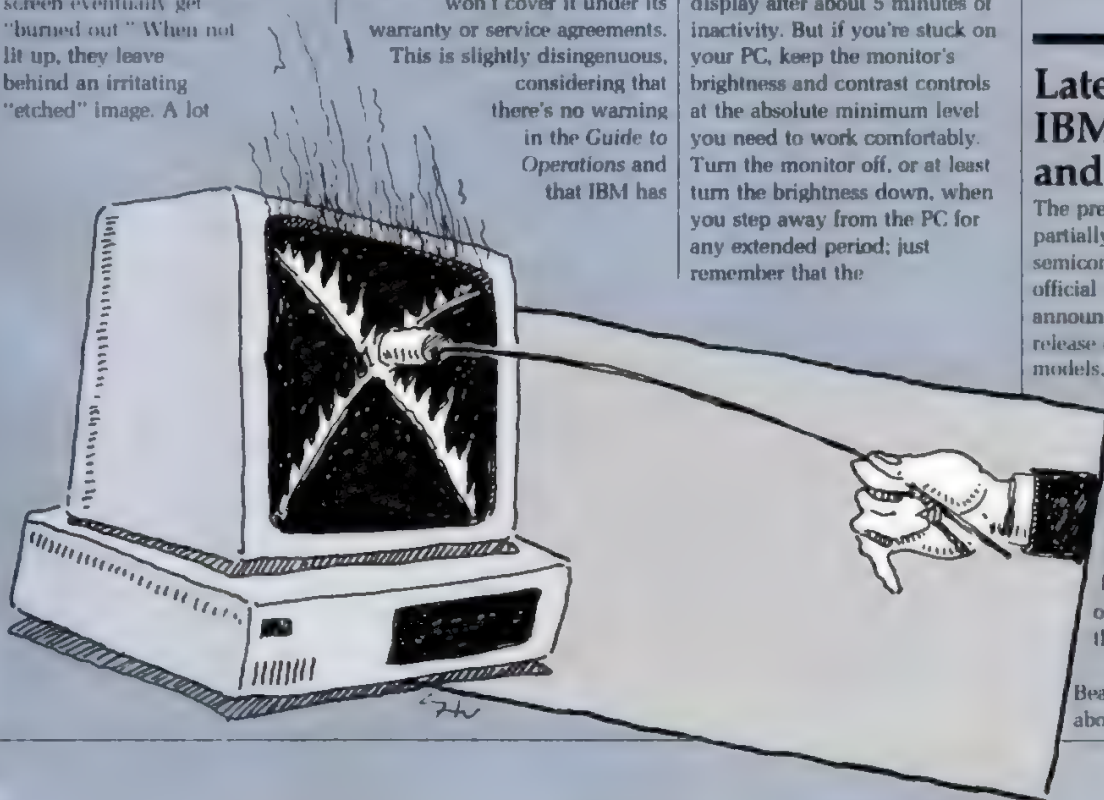
—Stephen Manes

Latest Scoop On IBM's "Popcorn" and "Peanut"

The prematurely, if only partially, denied unofficial semiconfirmation of the almost official report of the tentative announcement of the quasi-release of the so-called new models, as it were, of the IBM PC

has now been informally denied. The belated announcement of the formal denial of the prematurely confirmed refusal of the parties involved to say anything is to be followed by a partial report of an official refusal to deny the rumor of a confirmation.

(Apologies to J.B. "The Beachcomber" Morton for the above.)



PC Communiqués



Gold and Platinum Diskettes

In the music business it used to be hot news if a record sold to the tune of \$1 million—that made it solid gold. Nowadays, a band is going nowhere until its records hit platinum—a million copies sold.

Mega-figures can be found in the software business, though without the same glitter. International Computer Programs, Inc., of Scottsdale, Arizona, gives awards to software products with cumulative wholesale revenues of \$1 million or more. It presented 29 plaques at the first ceremony in 1972. This spring, International handed out over 500 awards, including the top prize for Total, a mainframe database system with \$250 million in sales.

Among the microcomputer mega-sellers is WordStar, which passed the \$25-million mark last year. This spring, VisiCalc reached the same level and dBase II qualified for the \$10-million award.

So what's the prize that honors the "top of the flopps"? Only a plain plaque, sad to say. The platinum diskette has yet to arrive.

New Chips from Intel's Block

Amazing, the stuff that keeps crossing our desks from Intel. Exhibit A is a spec sheet on the 82720 Graphics Display Controller. Turns out this is Intel's version of the powerful NEC 7220 chip that controls the displays of just about every major new Japanese micro around.

Will this Americanized chip be the heart of a new higher-resolution IBM color/graphics board? We didn't even bother to phone Big Blue for the mandatory "no comment."

There's also Intel's own 82730 Text Coprocessor. It'll work with

the 82720 Graphics Display Controller to put true proportional spacing, subscripts, superscripts, and multiple fonts on the screen. Don't expect to see this one in a hurry, though. Right now it costs about as much as Intel's major microprocessors—a little bit pricy just to make subscripts (like H₂O) and italics come out right.

Finally, there's a humbling note for IBM PC owners who lord it over users of older machines by smugly humming a bit of Chuck Berry's "Sweet Little Sixteen." On the spec sheet for its 80188—a single chip that is more or less the electronics of the PC's entire system board (minus RAM)—Intel calls it a "high-integration 8-bit microprocessor." Drat!

—Steven Manes



More PC-DOS 2.0 Woes

Microsoft is leading us into the future with PC-DOS 2.0, all right, but it can be a hazardous journey. Many 2.0 features are straight out of Xenix, especially the hierarchical directory capability. Unfortunately, it doesn't have Xenix's log-in ID's and permission levels to protect against dumb or

accidental commands that can result in catastrophe.

With PC-DOS 2.0 you are, in Unix/Xenix terms, the super-user. This means that you or anyone else can clobber the system any old time, from within any directory or subdirectory. Let's say you're in a subdirectory and you misinformedly type `ERASE \` because you want to eliminate all the files in that subdirectory. The system asks, "ARE YOU SURE?" and then—as if by

magic—all the files on your disk that are not in directories disappear. These include `COMMAND.COM` and everything else that isn't a hidden file—but not the directories. They have to be empty first; then only the Remove Directory (RD) command will erase them.

Having the ability to erase master directories from subdirectories is bad enough, but the ease with which you can wipe out everything constitutes a major design flaw.



Computer Chic

Computers might not be as rare and attractive as diamonds, but they can be equally expensive. The Beverly Hills Computer Store promotes the personal computer's position as a status symbol by displaying PCs, Coronas, and other computers in a jewelry store ambiance. Machine and circuit boards repose on black velvet in glass cases, tastefully festooned with diamonds.

Owner Murray Goralnick maintained the fine local tradition of unlisted telephone numbers by declining to reveal the names of celebrities who have patronized the store. He said that most of them were sensitive about exposing their inexperience with computers. Several had arranged to visit the store after hours to escape the public eye. "Once any of them get good at using the computer," Goralnick added, "I'm sure they'll be eager to let the world know about it."

The Beverly Hills Computer Store is located at 9666 Santa Monica Blvd., Beverly Hills, CA 90210. (213) 276-6100.

PC-Communiqués Pays

Do you have news, gossip, or unusual computer tales for PC-Communiqués? We will pay up to \$50 for each submission used. You must include your name, address, and telephone number with the item. We will preserve your anonymity if you wish. All submissions become the property of PC and are subject to editing. Our User-to-User section also publishes and pays for readers' submissions; that section features tips, problem solutions, and short programs or routines. Please send submissions to the appropriate department—PC-Communiqués or User-to-User—at PC, One Park Ave., New York, NY 10016.

Software Sampler

SoftLink Corp. is leaving no disk unturned in its search for markets. This Santa Clara, California company has arranged with Sysgen, Inc. to supply encrypted versions of Chang Laboratories software on the back-up tape in its mass storage devices.

Purchasers of Sysgen's hard disk with streaming tape back-up systems will be able to test nine programs, including MicroPlan, ProfitPlan, GraphPlan, DocuPlan, MemoPlan, FilePlan, and DataPlan, free of charge. If a user likes what he sees, he can arrange with a retailer to pay for the software and be issued a keycode that unlocks the full program. If he doesn't like the software, though, he can simply erase the tape. The whole set of nine programs has a list price of about \$3,000.

SoftLink normally sells encrypted trial versions of programs for \$49.95 each. It waives this fee for purchasers of Sysgen's systems—anyone who pays \$995 to \$3,795 for a peripheral device is likely to be a serious customer.

Chang Laboratories and Sysgen, Inc. expect that SoftLink's marketing matchmaking will stimulate their sales of software and hardware, respectively. Richard Newsome, Sysgen's marketing director, said that this software "giveaway" should benefit everyone in the marketing chain—except for the distributors, who will be bypassed in this arrangement. He added that an encrypted version of nearly every program now available for the PC could fit on just one of Sysgen's 20-megabyte tape cartridges.

PC-Communi^é

A Different Sort Of "Computer Network"

If Oakland University of Rochester, Michigan has its way, HBO, MTV, and Showtime will have to make room for the world's first cable television channel devoted exclusively to computer information and instruction: "Your Computer Channel."

The channel would provide daily 24-hour instructional programming and interactive two-way services, including pay-per-view, access to Dow Jones I and II and The Source, video and video-audio teleconferencing, electronic mail, energy monitoring and management, automated water meter reading, and security and medical monitoring.

Subscribers would be able to rent or lease computer equipment from local retailers and cable operators on a monthly basis. Manuals and other learning materials would be provided by participating cable operators, schools, and computer companies.

Oakland University plans to conduct a pilot project on one or more two-way interactive cable communications systems now being built in Oakland County, Michigan. If the project is successful, Your Computer Channel will be on the air by the Fall 1984. If you're interested in knowing more, write to Audrey Marriner, Cable TV office, Oakland University, Rochester, MI 48063, or call (313) 377-3272.

IBM Maintenance Options

Maintenance agreements are now available from IBM for service of its PCs and XT's. A variety of options is offered, including arrangements for on-site servicing and for carrying in units to a nearby Service/Exchange Center. The least expensive agreement has users mail troubled elements to IBM's Regional Repair Centers.

For further information, call (800) 428-2569; IBM owners in Hawaii, Alaska, and Guam can call (312) 986-7451 collect.



The First Computer Manual

We should be glad that one man didn't spare the rod. Scottish mathematician John Napier (1550-1617), best known for inventing logarithms, is also arguably the father—or perhaps grandfather—of the computer age. Why? By virtue of a set of mechanical calculating rods he invented, nicknamed "Napier's Bones."

But Napier deserves credit (or blame?) for another innovation. He wrote the world's first computer manual, a book entitled *Rabdologiae* (Latinized Greek for "the study of rods"). Measuring only 14.5 by 8 centimeters (about half the page area of PC manuals), it explains methods of manipulating the "bones" to perform lightning-fast calculations. The engraved rectangular rods, with marked and numbered surfaces, produce results in the now-familiar binary form. Napier compiled this primordial computer documentation in 1617, the year of his death.

Jeremy Norman, a San Francisco-based antiquarian, owns one of the few privately-held copies of *Rabdologiae*—his asking price is a paltry \$9,500. Norman has collected information on the history of computing devices for 20 years, starting "before it was fashionable." He notes that, although calculating devices existed in India and Persia much earlier, Napier's was the first such machine in the Western world—no bones about it.

"I HAVE NO sympathy nor belief in the idea of a computer being able to replace a man, a computer being able to replicate itself, or any of these notions people have."

Thomas J. Watson, Jr.
former chairman and C.E.O. of IBM
in an interview with Jack B. Rochester

NEW EXCITEMENT FOR YOUR IBM® PC!

J-BIRD

It's new! A battle of quick reflexes and wits—not firepower.
Your goal is to change the color of your world. But first, you must maneuver around hoards of hazards, outjump King-Bo the snake, dodge mind globes, outsmart Hob and Nob when they try to slow you, and pursue the time spheres in your world. It all makes for more fun than you've had in a long time!

Special features include: incredible graphics and sound; joystick or keyboard operation; two player option, on off sound; joystick calibration; high scores saved on disk.

J-BIRD is written totally in machine language for beautiful, smooth animation. Multiple play levels make J-BIRD a game that everyone can enjoy. Requires color graphics adaptor & 48K RAM.



PC-MAN AND THE MICRO MONSTERS

Beautiful colors! Arcade quality graphics! Stunning resolution! Exciting music and sound! Need we say more!
Written entirely in machine language for smooth animation. Requires color graphics adaptor and 48K RAM.

WIN AN IBM® PC!

That's right! Send us your best game and enter the ORION SOFTWARE FUN FOR ALL Contest. We'll be giving away an IBM Personal Computer—and you could be a winner! Call or write to ORION for contest details today!



ORION SOFTWARE

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Available at **ComputerLand** and other fine PC dealers.
For your nearest dealer, or to order direct call: **1-800-821-8088**.
To order by mail send \$34.95 for PC-MAN, or \$36.95 for J-BIRD to ORION SOFTWARE, P.O. BOX 2488, Dept. 283, Auburn, Alabama 36831



CIRCLE 349 ON READER SERVICE CARD

IF YOUR DATA'S WORTH REMEMBERING, IT'S WORTH PROTECTING.



POWERMAKER[®] MICRO UPS

A split-second blackout or a sudden voltage sag can shut down your small business computer, completely wiping out critical data. Inventories, payrolls, receivables — whatever is in the memory may be lost instantly.

Although this type of data is just as important to a small business as it is to a large corporation, blackout protection has always been far too costly for small business applications. But now there is the Powermaker Micro UPS, an inexpensive standby power source specifically designed for small business computers.

This new rechargeable power system provides up to 35 minutes of steady sine-wave power, enabling even the most sensitive small computers to ride through blackouts and voltage sags completely unaffected.

Why sine-wave power? Because square-wave power impairs the performance of many printers, viewing screens and timing circuits. Powermaker produces a sine wave that exactly matches the wave shape of commercial power,

ensuring compatibility with any computer system.

In addition to providing highly reliable blackout and brownout protection, Powermaker also protects against electrical noise, one of the major causes of computer errors and system malfunction. Powermaker is portable, completely automatic, maintenance free and plugs into any standard 120V outlet.

No matter how small your computer, your data is worth remembering. Protect it with an affordable Powermaker Micro UPS.

For complete information about the new Topaz Powermaker Micro UPS, please fill out this coupon or call us.

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TO YOUR HAT,
CHARLIE...**



THE CORONA PC'STM ARE HERE.



The Corona PC's, desktop and portable, give you everything you've ever wanted in an IBM-compatible PC and more. For a great deal less.

Compatible and more.

The Corona PC is a 16-bit microcomputer based on the 8088 microprocessor, just like the IBM PC. And like the IBM PC, it runs any software that conforms to the IBM standard.

But unlike the IBM PC, the Corona PC comes with 128K of memory. Supports up to 512K on the main board. Includes a 320K floppy drive, a communication port, a printer port and an improved IBM PC keyboard.

Both the desktop and portable Corona PC's include high-resolution monitors and built-in graphics. Higher character definition makes both models easier to read, and our 640 x 325 pixel high-resolution graphics are over 60% better than the

IBM PC. It's a complete system, the standard for microcomputing in the IBM-compatible world.

You can take it with you.

And unlike IBM, we have a portable version.

Its high-resolution, high-contrast 9" display is easy to read. It has all the power and features of our desktop, but lets you take it to the office next door, across the country or just conveniently tuck it onto a corner of your desk.

More expandability.

You may never add a thing to your Corona PC because we've built in so much capability.

But just in case, we've built all the important components into the main system board, leaving the four expansion slots free. And provided an extra large power supply to support any capabilities you may want to add in the future.



RAM-disk for incredible speed.

Our RAM-disk software lets you treat an area of your computer's memory as if it were a disk drive. So you can copy your programs and data into memory, then watch your work get done faster.

More software.

The Corona PC includes the MS-DOS operating system and comes with GW-BASIC, the MultiMate¹ word processor and the PC Tutor² training course. So you can start being productive immediately.

And you can run Context MBA³, dBASE II⁴, LogiCalc⁵ and LogiQuest⁵, the EasyFamily⁶, Wordstar⁷ and the "Star" family, the SuperWare⁸ series, T.I.M.⁹, the VisiSeries¹⁰ and Perfect Series¹¹ of programs and most other popular software.

And it improves your bottom line.

The Corona Portable PC™ is \$2,545, the desktop

version is \$2,595. Both about a thousand dollars less than the equivalent IBM PC.

For more information, contact Corona Data Systems, 31324 Via Colinas, Westlake Village, CA 91361. (213) 991-1144. Call (800) 621-6746 toll-free.

Or better yet, just grab your hat and head to the nearest Corona PC dealer for a very convincing demonstration.



© Corona Data Systems 1983. 1: TM Softword Systems. 2: TM Comprehensive Software Support. 3: TM Context Management Systems. 4: TM Ashton-Tate. 5: TM Software Products International. 6: TM Information Unlimited Software. 7: TM Micropro. 8: TM Sorcim Corp. 9: TM Innovative Software. 10: TM Visicorp. 11: TM Perfect Software Inc.

CIRCLE 204 ON READER SERVICE CARD

If you stick with timesharing after reading this ad, you haven't read this ad.

Typically, financial planning on a timesharing service runs \$2,000 a month and more. Month after month after month.

And it doesn't take a spreadsheet to figure that as a \$24,000-a-year-after-year expense.

The incredibly cheap alternative.

The Financial Planner™ from Ashton-Tate can stop this cash drain once and for all.

You pay \$700 — one time — for the Planner. And handle your financial planning quickly, easily and completely on your microcomputer.

Without having to share your time or your money with anyone.

A forecaster's dream come true.

The Financial Planner has enough depth to solve the most complex business problems you can foresee, yet can be used almost intuitively.

The Planner automatically performs calculations on individual items, rows, columns and entire models. Understands conditional logic. Solves simultaneous equations. Computes Present Value and Internal Rate of Return. Reads and writes dBASE II™ files. And much, much more.

But you use abbreviated names, not mysterious formulas. And you communicate with the computer in the English-like vocabulary of FPL™ (Financial Planning Language), so you can easily set up your budgeting and evaluation models.

Editing and report-writing are an integral part of the package, and you can preview results on the screen, then produce presentation-quality financial reports directly.

And when you have your models and reports just right, you can automate them so even your President can run them.

With the Planner, you produce P & L forecasts and financial consolidations in minutes. Explore



"what if" alternatives. Analyze new business ventures and mergers. Plan real estate acquisition and development. And fine tune operations until you reach the financial objectives you've set.

It's one of the most comprehensive business tools available on any computer. All for a fraction of what you've been spending on timesharing services to do the same things.

For the ardent skeptics.

It may sound too good to be true, but you can check out the Financial Planner with no financial risk.

Run through a hands-on demo at your nearest computer or software store. Then take a package home and use it for 30 days on your IBM PC or CP/M microcomputer. If it's not everything we said it was, just return it and you'll get your money back.

For the name of your nearest dealer, contact Ashton-Tate at 10150 West Jefferson Boulevard, Culver City, CA 90230. Or better yet, call (213) 204-5570 today.

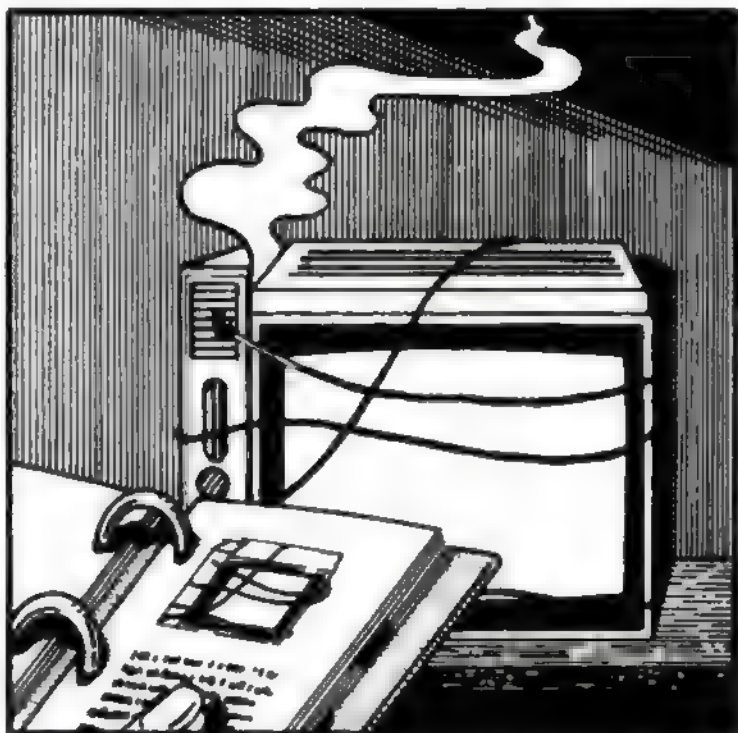
Time's a-wasting.

**The
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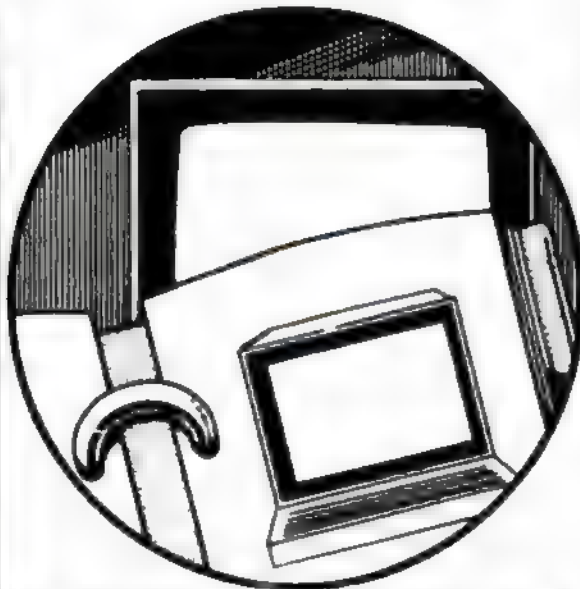
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DATABASEZERO™

THE COMPUTER ZONE™



Homer Uzerfrendli began his computer zone odyssey the day his Serling 70 arrived. Setting up seemed easier than he'd imagined — he just followed the diagram in the Operations Guide. He had no problems until he turned the power on.



A quick check of the "Things We Didn't Tell You Yet" section directed Homer back to the installation diagram (which seemed slightly different than he remembered it). The second arrangement proved more successful.



Now it was time to try out the DRASTIC Training Kit. The salesman had assured him it was the best on the market and, "I gave one of these to my mother for Christmas — she's ninety — and now she's networking with the Pentagon."



Homer inserted the disk and put on the bracelets that came with the kit. He wasn't sure what they were for, but he found out the first time he punched the wrong key.

What really disconcerted Homer, however, was receiving a bank statement the next week that revealed the Serling 70 had debited his account \$75 for each wrong answer and taken out a loan for \$9000 to cover his overdraft.



Envision a single high-speed communications board with integrated, easy-to-use software that emulates any terminal.



It's not just your imagination. It's Linkup.™

At ITI, we know your data communications must be fast, accurate and inexpensive. Our engineers faced the same communications problems you face. That's why they designed Linkup™ for the IBM PC.

With Linkup, you have a high-speed, programmable communications processor integrated with user-oriented software that provides cost effective access to an international network of host computers, terminals and other personal computers. You'll be able to transfer text, graphics, facsimile images, telemetry and program files as easily as dialing a phone number.

Communication modes support high and low speed access to computing and data base services, electronic mail, order entry, credit verification, tele-conferencing and direct marketing.

Linkup is the only communications hardware you'll ever need.

A single plug-in hardware module with the standard software emulates TTY, ASCII block mode, IBM 3101, IBM 2780/3780, DEC VT 52/100 and Tektronix. IBM 3270 and 5250 are scheduled for mid-year introduction. Terminal emulation modes are changed by a single keystroke without changing diskettes and switching modem cables to different hardware interfaces. And most importantly, the same familiar user command set appears in all modes.

Linkup grows to meet your changing needs.

Future terminal protocol emulation software will integrate into our programmable hardware controller. And, Linkup's high-speed data throughput will allow you to take full advantage of increases in common carrier transmission line speeds with no modification. Linkup is available for users and systems developers who wish to integrate our com-

munications capability into their unique systems, on a select OEM basis.

Linkup is cost-effective.

Linkup's single communications board does more than several others combined, leaving your computer's precious board slots open for further applications. And its powerful MC 6809 co-processor chip handles all communications tasks, freeing the PC to service the user interface.

Faster, more accurate transmission means lower costs.

Linkup's integrated design architecture reduces connect charges by transmitting and receiving data at speeds up to 19.2 Kilobaud asynchronous and up to 56 Kilobits per second synchronous without the loss of data throughput normally associated with such speeds. Reduce file storage charges on a remote computer system by transferring the file at high speed to the PC's disk, then print off-line.

Linkup utilizes block error control.

The module checks each line for error as it's received, retransmitting only those lines in error, instead of entire pages. That saves connect time and character transmission charges.

Our innovative fill-in-the-blanks technique overcomes the tedium of question-answer interrogation and menu approaches.

The user simply enters phone numbers, passwords and job file

names on a consistent fill-in-the-blanks form. Communication options and commands are displayed on the screen form and selected with a single keystroke. The user is not forced through a series of lengthy menus just to change a single item.



Linkup works around the clock so you don't have to.

Linkup automatically executes tasks. It dials, signs-on, runs a job unsupervised and maintains a log of its activities. Unattended operation at night, on weekends and on holidays provides the lowest rates from both common carrier and computer services. It uploads, downloads and does printouts while you're away. And when you return, your data is ready and waiting, so you can put your time to its best use.

If you want to communicate, call ITI toll-free 800-431-3460 for additional information.



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(602) 998-1033

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Linkup Specifications

Speed:

Continuous throughput of 56 Kbps Synchronous, 19.2 Kbaud Asynchronous

Terminal Emulation Modes:

TTY, ASCII Block Transfer, DEC VT 52/100, IBM 3101, IBM 2780/3780, and future options include 3270, 5250, Tektronix.

File Types:

ASCII, EBCDIC and Binary with enhanced user commands, e.g. SEND, RECEIVE, APPEND, EXAMINE

Automatic Modes:

Dialup, Log-on, Job Execution, Answer, Alert, Unattended Job Scheduling, File Upload/Download and print.

Communications Interface:

Dual channel RS232C/423 compatible.

Modems:

103, 212, 201, 208 Bell compatible, Hayes, Vadic, Rixon and Omnitec smart modems, or user defined.

Bus Interface:

IBM PC bus compatible.

PC Configuration:

PC DOS, 64 Kbytes RAM, 160 KB Floppy, monochrome display minimum. Also supports IBM compatible hard disks, color displays and printers.

Options:

Printz™ Print Spooler
Postmaster™ Electronic Mail
Audit™ Billing Summary

Base Price:

\$795 each, including TTY and ASCII block software.

Test drive our mouse.

It's no secret. This is certainly "The Year of the Mouse."

And the uproar is justified.

This "see and point" interface is the most natural, powerful and efficient way to interact with your computer.

And Mouse Systems' optical PC Mouse, now available with software support for the IBM PC, is easily the best of its breed; easily the best at making your computer user-friendly.

Grasp The Future of PC Technology

Slide our PC Mouse across its despad. It's optical. There are no moving parts. Your cursor instantly moves across your CRT in response.

No other device gives you such total, accurate control over cursor positioning.

The ergonomically designed PC Mouse is so smooth and natural in its movements, you'll soon be using it almost subconsciously.

Your attention can thus remain on the screen and not on the keyboard, and your concentration will be increased dramatically.

PC Mouse lets you use this new freedom to take full advantage of today's "visual" software products.

(For a truly enlightening experience, ask your dealer to demo PC Mouse with IBM's Personal Editor.)

PC Mouse vs. The Keyboard

Named Mini/Micro's most significant new product of 1982, PC Mouse lets you bypass your keyboard

for instant menu selection and function activation.

And PC Mouse requires no changes in your existing software. All cursor-related functions in 1-2-3, WordStar, VisiCalc, and other popular programs are replaced by the mouse.

In one darting stroke, you eliminate the pondering and second-guessing of typing complicated command codes.

For systems designers and OEM's PC Mouse's potential is staggering.

Simplicity, Itself

Just attach the PC Mouse to your PC's RS-232 port.

Each of the three buttons is user-programmable, giving you nine different functions at your fingertips.

And our software compatibility assures instant system integration and simple start up.

Get It Now

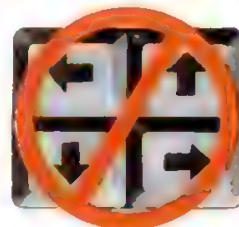
PC Mouse is immediately available for \$332.00 including control software and all necessary hardware for your IBM PC.

For ambitious software developers, the optional \$40.00 MouseWindow™ software package

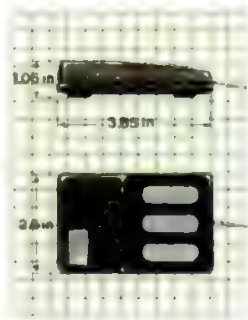
includes routines to do high resolution graphics and "pop-up" windows.

An OEM version of PC Mouse can also be supplied in quantity now, configured to your custom specifications.

For more details see your dealer, or contact Mouse Systems at 2336H Walsh Avenue, Santa Clara, CA 95051. Telephone (408) 988-0211 or Telex 467848.



PC Mouse keeps your attention on your data, not on your keyboard.



Slim, compact size allows brisk moves in any direction.



Mouse Systems

Making Computers User Friendly.

SMALL CARDS WITH BIG FEATURES ... FROM APSTEK

NEW SIC-1

SERIAL INTERFACE AND CLOCK/CALENDAR

- ASYNC. COMMUNICATIONS PORT
configurable as COM1; or COM2;
selectable interrupt level
- CLOCK/CALENDAR
crystal-controlled accurate
utility software included

only \$149 each

APSTEK is leading the way with literally new products for IBM Personal Computers. The SIC-1 and PIC-1 have been designed to add much wanted functions at a low price. Both are fully compatible with IBM Personal Computers and will fit the small slot in the AT.

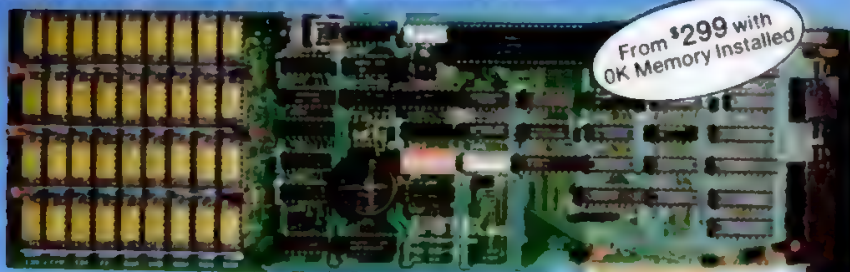
The SIC-1 and PIC-1 add a much needed serial and parallel printer port and a clock/calendar to a cost of only a few dollars more than the ports alone. The clock/calendar maintains accurate time and date. Its internal battery provides a long lasting reliable power source when not in use.

All APSTEK products are fully guaranteed 1 year.

PIC-1

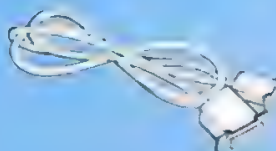
PARALLEL PRINTER PORT AND CLOCK/CALENDAR

- PARALLEL PRINTER PORT
Compatible with ECP, EPP and LPT2
and LPT3. The Parallel Port Adapter
also includes Print Spooler Software
- CLOCK/CALENDAR
crystal-controlled accurate
utility software included



APSTEK MULTI-FUNCTION CARD

- Up to 256k Parity-Checked Memory
- Asynchronous Communications Port
- 6 ft. External RS232 cable included
- Parallel Printer Port
- Clock/Calendar
- Software Includes:
Time/Date Set, Electronic Disk,
Print Spooler and Diagnostics



SUGGESTED RETAIL PRICING

SIC-1 Serial Interface/Clock	\$149
PIC-1 Parallel Interface/Clock	149

AIC-256 - Multi-Function Card

AIC-256-05 with "0"K	\$299
AIC-256-01 with 64k	369
AIC-256-02 with 128k	439
AIC-256-03 with 192k	509
AIC-256-04 with 256k	579
AIC-256-09 64k upgrade kit	69

AIM-256 - Memory Card

AIM-256-05 with "0"K	\$199
AIM-256-01 with 64k	269
AIM-256-02 with 128k	339
AIM-256-03 with 192k	409
AIM-256-04 with 256k	479
AIM-256-09 64k upgrade kit	69

APSTEK INC

2636 Walnut Hill Lane, Suite 335
Dallas, Texas 75229 • 214/357-5288

CIRCLE 123 ON READER SERVICE CARD

DEALER INQUIRIES INVITED - 214/357-5288

**HERE'S WHAT
OUR NEW, 1200-BAUD,
DO IT ALL,
ONE STOP SHOPPING,
DON'T BREAK THE BANK
MODEM FOR YOUR IBM PC
LOOKS LIKE:**

Introducing the PC: IntelliModem™ from Bizcomp. With your IBM PC or XT, it looks like a big nothing.

That's because it's *inside*. Where any modem connecting your Personal Computer to the telephone network should be. And where you won't have to worry about all those little boxes, couplers, cables and power cords getting in your way. Or being knocked off your desk.

But just because the PC: IntelliModem is out of sight, doesn't mean it'll ever be out of mind. You'll continue to be impressed with its do-it-all capabilities for years to come. Advanced data comm capabilities such as automatic dialing and auto repeat dialing, for selectively calling people or other computers from your own computerized telephone directory. Or automatic answering, so your PC can receive messages even when you're not in the office.

More than just a modem.

Even more impressive is the PC: IntelliModem's ability to *integrate both voice and data communication*. By plugging a regular handset into the back of your PC, you can

So, where is it?

now switch between talking or listening and sending or receiving data—without having to hang up, re-dial or plug and unplug a lot of cables. So making connections is now much faster and more convenient.

The PC: IntelliModem comes complete with everything you need to start communicating immediately. Besides its sophisticated Bell 212A-compatible hardware, the PC: IntelliModem includes a "friendly" software package with screen menus to guide you during use, plus complete written instructions for reference. And all this one-stop-shopping convenience is included in our modest price: \$499. Which shouldn't break anybody's bank.

So if you're ready to turn your PC into a fast-talking data communications tool, ask your local IBM dealer about the Bizcomp PC: IntelliModem. It's a whole lot more than a modem. Even if it looks like a great big nothing.

PC IntelliModem is a trademark of Business Computer Corporation. IBM is a trademark of International Business Machines Corporation.

CIRCLE 171 ON READER SERVICE CARD

BIZCOMP™

532 Weddell Drive
Sunnyvale, CA 94086
408/745-1616



IBM PC-related instruction ranges from incoherent lessons on cassette tape to a weekend at computer camp in Wyoming. In the absence of standards, it's a good idea to ask lots of questions before you sign up.

In Search Of Computer Training

Are you an old-fashioned guy or gal? Would you rather have a real flesh-and-blood teacher accompany you through the trauma of learning how to use a PC or a complex application program?

For people who are sick of staring at unhelpful manuals and want real people to help them learn to communicate with their machines, computer courses are available in most parts of the country, and many are specifically aimed at users of the IBM PC and PC software. The courses range from college-level instruction to informal sessions in computer stores or

through users groups.

The computer education business for individuals is growing rapidly. The future may hold standardized courses nationally. One large retail store claims to have been so successful with a training program that it now plans to market it nationwide. At other stores, training may be less organized; some users told PC Magazine of teachers who may have known the material but were unable to make themselves understood to the uninitiated. One woman reported an instructor who "couldn't tell a keyboard from his big toe."

Audio/Visual Instruction

In the area of video cassettes, homework and TV are no longer adversaries.

Alternatives to classroom instruction are also available. The two principal forms are disk-based and video cassette-based. You can also find audio tape instruction.

Most of the disk programs are interactive; they ask for your input from the keyboard before advancing through chapters.

They range in complexity from introductions to using the computer to tutorials on DOS and BASIC to specific applications programs including VisiCalc, WordStar, dBase II and Multiplan.

The video cassette offerings can range from elementary lessons ("How to Find the Power Switch") to more sophisticated offerings. The cassette player, though, is not directly tied into the computer. (For a glimpse of a system that may combine the two, see "Coming Attractions: The Super Video Instructor," in this issue.)

Here are some hints on how to choose a computer-assisted training package:

- Make certain the disk or cassette is compatible with your computer. If you have a PC-XT, does it take advantage of that machine's advanced features?

- Be sure that the version of the program to be explained is the same as the one you own. For instance, there are three versions of PC-DOS: 1.0, 1.1 and 2.0. There are many versions of WordStar: 3.1, 3.2, 3.24 and 3.3 among them.

- If you're purchasing a video cassette, make certain you receive the proper format—Beta or VHS. If you're buying a disk for the PC, don't accept a double-sided disk if you have single-sided drives.

- Find out as much as possible about the instructional level and style of the program. If you don't want to sit through 5 minutes of how to insert a disk properly in order to get to a point of advanced programming, beware of programs that are rigid in their insistence on progressing from Chapter 1 through Chapter 10 with no detours and no double-backs.

—Corey Sandler

How, then, do you find a good computer course? Perhaps the best place to start is where you purchased your computer. If computer dealers don't offer training programs themselves, they may know who does. Another good bet would be members of user groups. (Many are listed in PC Magazine; your computer dealer may know of others.) Be aware that user groups

lecture, without any hands-on experience, or will there be PCs or PC-compatible computers available? Which do you feel offers more for your needs?

- How many students per computer? More than two will greatly limit your access. Are you a loner or do you prefer the buddy system?

- Does the schedule meet yours? You may want to take the whole course in one day, or you may want to spread it out to allow time to absorb the lessons and apply them to your specific needs.

- Is there any way you can use a computer after class for practice? Is there a charge?

- What are the teacher's qualifications. Are the instructors also sales people? Do they have technical degrees? If you're interested in business applications, do they have practical experience in applying the programs they preach? Are they talking about spreadsheet strategies for a company the size of IBM when you're trying to manage the corner candy store?

- Finally, make certain that the course you choose really does apply to your needs. One salesman promised us that his Apple machines were perfectly compatible with PCs. (They're not, of course.) If you enroll in a course that mixes Apples and IBMs or any other microcomputer, check that all the course materials and demonstrations cover all models.

The listings provided here are only a scattered sampling of short-term computer education courses around the country. The courses have not been reviewed. Good luck and good grades! /PC

ONE SALESMAN promised us that his Apple machines were perfectly compatible with PCs.

vary greatly in level of organization, but the good ones are well-informed about what's going on in stores and schools. If you're trying to gather enough people together to interest someone—a store, a high school, the YMCA—in sponsoring a course, user groups are sure to attract other fledgling computerphiles as well. You can also try local libraries or universities, which often post circulars advising people about where they can take courses.

Choosing a Course

Here are some questions you should ask before choosing a course:

- What is the format? Is it one you will be comfortable with? Is the course merely a

Classes

COMPANY	COURSE TOPICS	LENGTH	COST	NUMBER OF STUDENTS	NUMBER OF PCS
ComputerPrep 10057 North Metro Pkwy. East Phoenix, AZ 85021 (602) 944-8258	DOS 1.1 with 2.0 update WordStar BPI—general ledger —accounts receivable 1-2-3 T.I.M. VisiCalc	½-2 days	\$35-\$175	24 or 12*	12

*These courses can be taken in either seminars or workshops. Workshops are intended for people with greater proficiency and are taught one-on-one rather than on the buddy system.

COMPANY	COURSE TOPICS	LENGTH	COST	NUMBER OF STUDENTS	NUMBER OF PCS
Accelerated Computer Training 18201 West McDermott #B Irvine, CA 92714 (714) 660-0455	Computer Fundamentals WordStar BASIC—beginners & advanced Database—beginners & advanced Pascal SuperCalc VisiCalc	1-4 days	\$99-\$198	24	12
IBM Product Center 425 Market St. San Francisco, CA 94105 (415) 545-5110	Intro to PC WordStar 1-2-3 MailMerge Multiplan VisiCalc	½-1 day	\$75-\$120	8	8
ComputerLand 207 Pitkin St. East Hartford, CT 06018 (203) 528-2114 (800) 922-3276 ComputerLand 111 High Ridge Rd. Stamford, CT 06905 (203) 964-1224 (800) 922-3276	Intro to Word Processing Intro to Database Intro to Spreadsheets WordStar dBase II 1-2-3 VisiCalc	½-1 day	\$80-\$200	12	6
Personal Computer Training Center 2120 L St. #102 NW Washington, DC 20001 (202) 466-7604	WordStar assembler Beginner's BASIC dBase II VisiCalc	12 hours over 3-4 weeks	\$195	3-10	■
ComputerLand 2777-6 University Blvd. West Jacksonville, FL 32217 (904) 731-2471 ComputerLand 9398 Arlington Expwy. Jacksonville, FL 32211 (904) 721-2233	Intro to Microcomputing Word Processing— WordStar Intro to Database Management —T.I.M., dBase II, Visifile Using Financial Spreadsheets —includes 1-2-3	½-4 days	\$50-\$150	10-20	6—PC or COMPAQ
ComputerLand 3224 Peachtree Rd. Atlanta, GA 30305 (404) 237-2080	Intro to PC WordStar BASIC Multiplan dBase II 1-2-3	10 hours—flexible scheduling	\$125	10-24	24

COMPANY	COURSE TOPICS	LENGTH	COST	NUMBER OF STUDENTS	NUMBER OF PCS
Information Science Associates 676 North St. Clair Chicago, IL 60611 (312) 787-2723	Intro to PC WordStar BASIC Business Programming—beginners & advanced IBM Microcomputer BASIC for Experienced COBOL Programmers dBase II 1-2-3 VisiCalc—beginners & advanced	1-2 days	\$115-\$365	10	5
Microcomputer Learning Center 120 West Madison #910 Chicago, IL 60603 (312) 332-0419	Intro to PC Word Processing with WordStar Spreadsheets—Multiplan—SuperCalc—VisiCalc	Seven 1½ hour sessions over 5 weeks	\$125	5	4
ComputerLand 1003 Meridian Plaza Anderson, IN 46016 (317) 649-1122	How to Use PC-DOS WordStar BASIC—all levels Intro to Database Management Spreadsheets	½-2 days	\$20-\$90	15	PCs and COMPAQs available
Computerland 911A West 37th St. Topeka, KS 66611 (913) 267-6530	Intro to PC-DOS InfoStar SpellStar WordStar BASIC dBase II MailMerge Multiplan PFS VisiCalc	½ day	\$50	6	6
Center for Management Development University of Louisville School of Business Louisville, KY 40292 (502) 588-6456	Intro to PC Intro to BASIC dBase II 1-2-3 VisiCalc	8-15 hours	\$120-\$300	5-15	5
ComputerLand 131 East Redwood Baltimore, MD 21202 (301) 837-5678 ComputerLand 1516 York Rd. Lutherville, MD 21093 (301) 337-5555	assembly Language Programming BASIC Programming VisiCalc	7½ hours over 5 weeks	\$50-\$75	Maximum: 25	Lecture format

COMPANY	COURSE TOPICS	LENGTH	COST	NUMBER OF STUDENTS	NUMBER OF PCS
Center for Computer Applications 334 Newbury St. Boston, MA 02115 (617) 247-0538	Intro to IBM PC WordStar Context MBA dBase II 1-2-3 Multiplan VisiCalc	½-1 day	\$125-\$145	8-12	■
Susan Harmon Transitions, Inc. 185 Corey Rd. Brookline, MA 02146 (617) 566-0596	WordPlus for PC WordStar DataStar MailMerge Supersort VisiCalc—beginners & advanced Visifile		\$35/hour	Harmon will tutor individuals or groups on their own PCs.	
Computer Tutor 554 Washington St. Wellesley, MA 02181 (617) 237-6061	WordStar dBase II 1-2-3 Multiplan SuperCalc VisiCalc	2-4 days	\$150-\$175	4-8	■
ComputerLand 22000 Greater Mack St. Claire Shores, MI 48080 (313) 772-6540	Intro to PC WordStar BASIC Programming Dow Jones Communications Software Electronic Checkbook 1-2-3 PFS: File VisiCalc	1-4 days	\$20-\$100	4-5	2-3
Schaak's Computer Academy Maplewood Mall Maplewood, MN 55109 (612) 770-1027	Intro to IBM PC WordStar BASIC Programming dBase II Multiplan SuperCalc VisiCalc	½-2 days	\$25-\$75	20	PCs available
ComputerLand 3640 South Campbell Springfield, MO 65807 (417) 887-2222	WordStar SuperCalc	2 days	\$25-\$35	8-10	8
Clancy Paul Microcomputer Learning Center 101 College Rd. East Forrestal Center Princeton, NJ 08540 (609) 452-0430	Intro to IBM PC 1-2-3 Multimate WordStar VisiCalc	½-1 day	\$100-\$250	4-5	4-5

COMPANY	COURSE TOPICS	LENGTH	COST	NUMBER OF STUDENTS	NUMBER OF PCS
Prodigy Computer Learning Center Colonial Square Mall 229 Route 22 East Green Brook, NJ 08812 (201) 752-6300	Using the IBM PC Word Processing— EasyWriter, WordStar or Wordplus BASIC on IBM IBM PC Filing Cabinet—VisiFile or dBase II Spreadsheets—VisiCalc or 1-2-3	12 hours over 6 weeks	\$120	12	6
Datel Systems 1211 Avenue of the Americas New York, NY 10036 (212) 921-0110	Using the IBM PC WordStar—beginners & advanced dBase II 1-2-3 SuperCalc VisiCalc—beginners & advanced	½–1 day	\$45–\$95	5–12	4
IBM Product Center 590 Madison Ave. New York, NY 10022 (212) 407-5909 IBM Product Center 90 Broad St. New York, NY 10005 (212) 407-5909	Intro to IBM PC EasyWriter WordStar 1-2-3 Multiplan VisiCalc	½ day	\$95	8	8
Instamation 131 Gould St. Rochester, NY 14610 (716) 461-1800	Intro to IBM PC-DOS Intro to Word Processing Intro to BASIC Intro to Business Graphics Intro to Database Managers Electronic Spreadsheets 1 & 2 Intro to National Networks —Interlink	½ day	\$45	12	demonstration on PC— 3 PCs available for after-class work @ \$21.50/hour.
ComputerLand 1300 S. O. M. Center Rd. Mayfield Heights, OH 44124 (216) 461-1200	WordStar BASIC Programming dBase II 1-2-3	6 hours over 3 days	\$60–\$125	12	12
ComputerLand 8191 South Harvard St. Tulsa, OK 74136 (918) 481-0332	Intro to PC-DOS EasyWriter II WordStar—beginners & advanced 1-2-3 T.I.M.-3 (with teaching help from a CPA)	½–1 day	\$40–\$195	7–8	7

COMPANY	COURSE TOPICS	LENGTH	COST	NUMBER OF STUDENTS	NUMBER OF PCS
ComputerLand 10621 North May Oklahoma City, OK 73120 (405) 755-5200	How to Use the IBM PC WordStar BASIC—all levels BPI (with teaching help from a CPA) dBase II How to Write a Database Program in BASIC 1-2-3 VisiCalc—beginners & advanced	½–4 days	\$30–\$150	24	4
ComputerLand Training Center 708 Southwest Third Ave. #218 Portland, OR 97204 (503) 295-1928	Intro to Microcomputers Word Processing Accounting Communications Database Management Electronic Spreadsheet	1–3 days	\$150	10	10
ComputerLand 9896 Southwest Freeway Houston, TX 77074 (713) 227-7656	Intro to IBM PC WordStar Business Graphics Communications Database 1-2-3 Multiplan SuperCalc VisiCalc	2–6 hours over 2–3 days	\$35–\$95	8–9	9
ComputerLand 888 South Greenville Richardson, TX 75080 (214) 363-2223	dBase II 1-2-3 MBA Multiplan VisiCalc		\$30/hour for as many hours as needed —three instructors available for teaching sessions.		
ComputerLand 1808 136th Place NE Bellevue, WA 98005 (206) 643-6262	Intro to IBM PC WordStar 1-2-3 Multiplan VisiCalc	½–1 day	\$75–\$150	16	10
ComputerLand 3502 East Washington Ave. Madison, WI 53706 (608) 833-8900	Intro to Microcomputers Word Processing Learning BASIC Database with PFS:File VisiCalc	6 hours over 3 days	\$45–\$130	16	8

COMPANY	COURSE TOPICS	LENGTH	COST	NUMBER OF STUDENTS	NUMBER OF PCS
Jackson Hole Personal Computer Resort Star Route Box 362A Jackson, WY 83001 (800) 443-8616	Intro to the IBM PC	18 hours	\$285	10	5

Traveling Lecture

COMPANY	COURSE TOPICS	LENGTH	COST	NUMBER OF STUDENTS	NUMBER OF PCS
SoftwareBanc 661 Massachusetts Ave. Arlington, MA 02174 617-641-1241 800-451-2502	Intro to dBase II Programming Advanced Techniques 1-2-3	4 days	\$175/day	200	Lecture format, with course materials provided.*

*This is a traveling lecture series, with the following schedule: Aug.: Anchorage; Sept.: New York; Oct.: Chicago; Nov.: Dallas; Dec.: San Diego

Disks

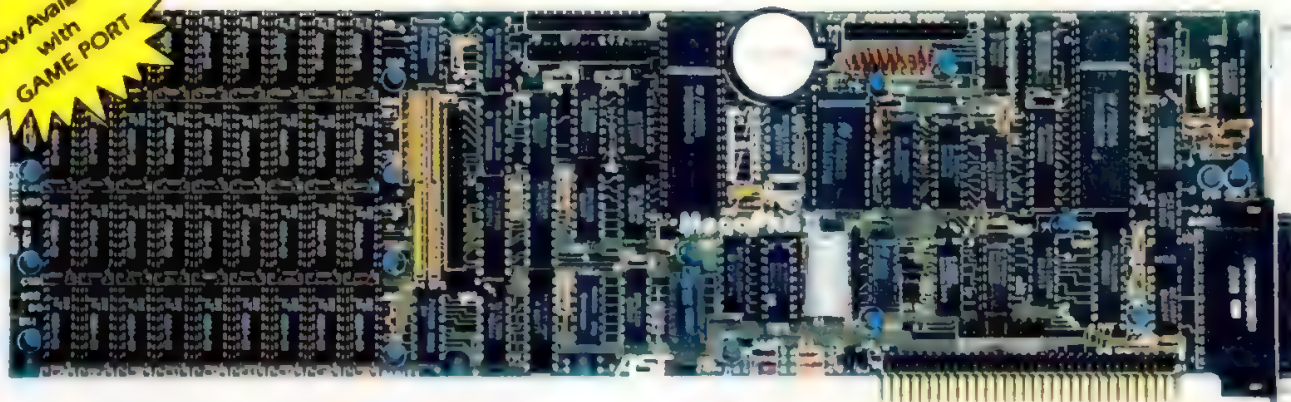
COMPANY	PRODUCT	REQUIREMENTS*	COMPATIBLE WITH	COST
American Training International (ATI) 3770 Highland Ave. #201 Manhattan Beach, CA 90266 (213) 546-4725	ATI training Power Series: PC-DOS EasyWriter II WordStar Benchmark dBase II Easy Filer Easy Planner MBASIC Microplan Multiplan SuperCalc VisiCalc	64K 1 disk drive	XT COMPAQ	\$75.00
Cdex 5050 El Camino Real #200 Los Altos, CA 94022 (415) 964-7600	How to Use Your IBM PC IBM PC DOS 2.0 EasyWriter II WordStar dBase II Managing Your Business with 1-2-3 Managing Your Business with Multiplan Managing Your Business with SuperCalc Managing Your Business with SuperCalc II Managing Your Business with VisiCalc Managing Your Business with Advanced VisiCalc	64K 1 disk drive	XT COMPAQ	\$69.95

*All disks are compatible with the IBM PC.

COMPANY	PRODUCT	REQUIREMENTS*	COMPATIBLE WITH	COST
Alphanetics P.O. Box 339 Forestville, CA 95436 (707) 887-7237	IBM BASIC Course	64 K 1 disk drive color board opt.	XT COMPAQ Columbia (any MS DOS)	\$39.95
Comprehensive Software Support 2316 Artesia Blvd. Redondo Beach, CA 90278 (213) 318-2661	PC Pal PC Tutor—more advanced than PC Pal	64K 1 disk drive	XT PC- compatibles	\$39.95 \$59.95
Computer Systems Research 40 Darling Dr. Avon Park South Avon, CT 06001 (203) 678-1212	IBM PC Primer— with 5 disks	128K 2 drives	XT DOS 2.0	\$900
Individual Software 24 Spinnaker Pl. Redwood, CA 94065	PC Instructor	PC DOS 1.0 or 1.1 64 K	XT	\$44.95
	Professor DOS	XT DOS 2.0 96K	XT	\$59.95
TexaSoft, Inc. 3415 Westminster #100 Dallas, TX 75205 (214) 369-0795	Your Personal Computer Tutor	DOS 1.1 or 2.0 64K 1 disk drive color or mono	COMPAQ Columbia	\$59.95
*All disks are compatible with the IBM PC.				

Videotape Training Programs

COMPANY	PRODUCT	TIME	COMPATIBLE WITH	COST
Computer Labs of America 9340A Clairemont Mesa Blvd. San Diego, CA 92123 (619) 576-1133	General Knowledge DOS WordStar dBase 1-2-3 MailMerge SuperCalc VisiCalc	30 minutes	XT	\$199/ tape, or leased to training pro- grams
Kennen Publishing Video Learning Library 150 Shoreline Highway Building D Mill Valley, CA 94941 (415) 332-5828	How to Use Your IBM PC in 10 Easy Video Lessons	2½ hours	XT	\$69.50
Micro Learning Concepts, Inc. 120 East 56th St. #503 New York, NY 10022 (212) 980-3552	Learning Concept: The VisiCalc Program Personal Computer Literacy	58 minutes	XT	\$129.95



MegaPlus II™: THE ULTIMATE EXPANSION FOR IBM® PC OR XT

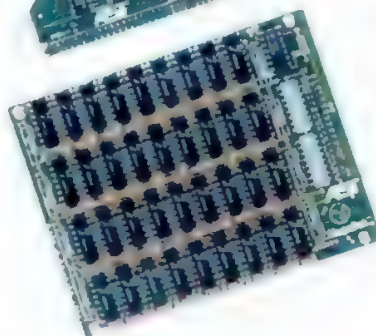
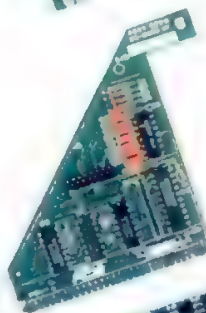
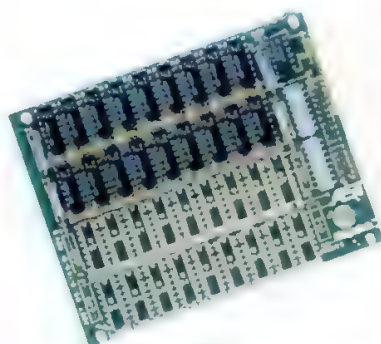
This **really** is the only board you need to expand your IBM PC or XT. There is quite a selection of multifunction boards available today, with many of their manufacturers trying to pile up the score of so called "functions". But when you look to see what they do you find some real creative definitions of "function" as well as some pretty useless features. MegaPlus II has the features you need on a board that is cost effective, versatile, and reliable. You can start out with the basics as standard equipment, and can add features as the need arises. Or you can get it all right now — in one slot.

THE BASICS

MegaPlus II has three functions standard: Parity checked and fully socketed memory up to 256k in 64k increments, clock/calendar with battery back-up, asynchronous communication port (RS232C serial) which can be used as COM1 or COM2, (DTE for a printer, DCE for a modem). Also included are SuperDrive™ disk emulation and SuperSpooler™ printer buffer software. Optional is a 100% IBM compatible parallel printer port, and a second async port for another \$35 each. Both options are socketed so you can add them later should the need arise.

CLOCK/CALENDAR & CLIP-ON BATTERY

Our clock is powered by a simple \$4 lithium watch battery. It is clipped on, not soldered like some other clock boards. How useful is a battery warranty that requires you to send your board to the manufacturer to replace it? We send you a diskette with a program that sets the time and date when you turn on your computer. Now your programs will always have the correct time and date on them without you ever having to think about it. [Just which version of that program you were writing is the latest one?]



THE MEGAPAKS

The pictures show the optional 256k MegaPak™, the 128k version, and the new game pak. These boards mount "piggyback" on the MegaPlus II. The 256k MegaPak gives the old style PC's with only 64k the ability to add 512k of memory in one slot. The 128k MegaPak is for the new machines that can hold 256k on their PC's motherboard. This board along with the 256k on the MegaPlus II gives you the total of 640k, the maximum usable under 2.0 DOS. Now you can create disk drives in memory up to 360k, set aside plenty of space for print spooling, and still have plenty of memory for your biggest programs. There is a new game port MegaPak option. It uses any IBM compatible joysticks or paddles. It plugs onto the pin connectors just above the edge connector so you can add one even if you have one of the memory MegaPaks.

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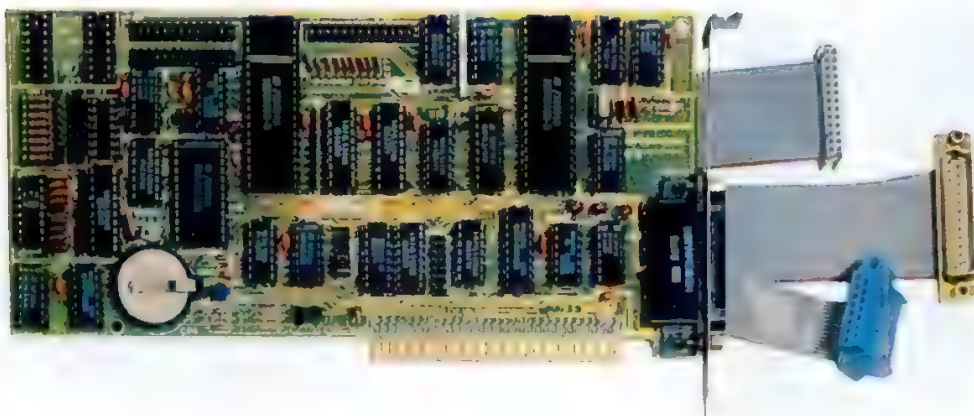
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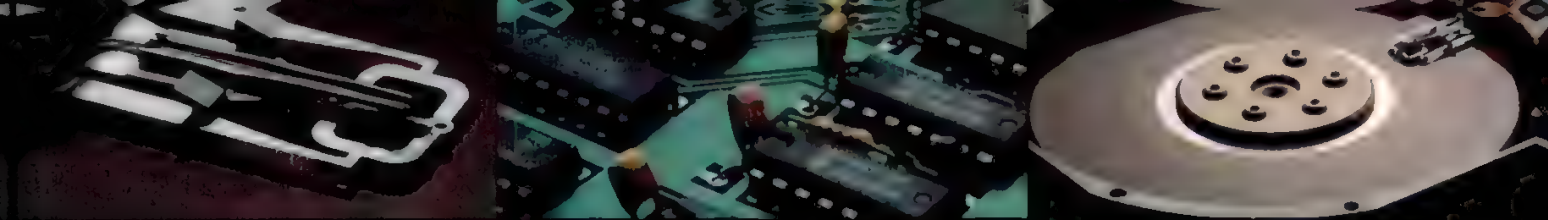


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CIRCLE 232 ON READER SERVICE CARD

(Unofficial) Report On IBM Product Center Multiplan Seminar

Memo to: The Chief
From: Agent 8088
Re: IBM's "Multiplan Seminar"
Confidential ...
For Your Drives Only

Well, Chief, it was a dirty job but somebody had to do it.

Actually, I know the reason I was tapped for this hazardous assignment: You figured that if anyone could teach me how to be competent at operating electronic spreadsheet software in a single afternoon, this man could. Well, he did, and I'm impressed. Did I ever tell you,

Chief, about the time I had an assignment from another magazine to attend one of those fancy vocational counseling institutes where you get aptitude-tested for days on end and then you find out what career you ought to be in? I remember the pitying expression on my tester's face after I took the portion of the exam that measures "accountancy" skills, the ability to deal with rows of numbers. "I hope," she said gravely, "that you never balance your checkbook without a calculator nearby." But I digress.

As you know, Chief, IBM has been offering training seminars on various software programs at some of its product centers. The seminars so far have included half-day sessions in DOS 2.0, home accounting, word processing (WordStar or EasyWriter 1.1), spreadsheet software (VisiCalc or Multiplan), and "Introduction to the PC," as well as a full-day course in the Lotus 1-2-3 integrated software package.

As IBM's promotional newspaper ads have pointed out, the groups are small; each course is limited to a maximum of eight students. Each student gets his own PC. My 3½-hour Multiplan class cost \$95. Naturally, I registered as a civilian, and no one knew until after the class was over that I was a spy from PC Magazine (more about this later.)

When I arrived in the classroom, I was at first delighted to notice that the majority of the student PCs were equipped with IBM's dazzling new color monitors. I didn't know much about Microsoft's Multiplan, but I did know that it made excellent use of color capability. Unfortunately, the rest of the hardware didn't live up to this standard of thoughtfulness.

For example, there was only one printer, which meant that when it came time to learn how to print out a spreadsheet, only one person could receive actual hands-on experience as the rest gathered round to

watch. This might not be a big deal—after all, I have a letter-quality printer at home so I wouldn't stand to profit from instruction on how to invoke the compressed-width print on an Epson—but it hardly seems in the spirit of IBM's vaunted one-PC-per-person policy.

A more serious problem was that most of the computers had only one disk drive. (No, I don't mean that the machines were XT's.) While I would probably be the first to object to a course that overlooked the fact that not everybody buys two drives, let's face it, most business users do. One section of the seminar did deal with the theoretical topic of "Using Two Disk Drives," but I would have preferred to use two, and learn theoretically how to use one. In this case, valuable training time was lost while students zipped diskettes in and out of the single available drive, a procedure that also made Multiplan (and microcomputing) seem more complicated than necessary. (At one point, I even found myself wondering if this was IBM's subtle way of making sure that it sells lots

of second disk drives.)

My teacher was an affable Southerner named Ken Wenzl. He had his work cut out for him, because although our class was tiny—there were only four of us—we

THEN THERE was me: first kid on my block to buy a PC, WordStar whiz but spreadsheet virgin, and notorious checkbook klutz.

were all at different levels. "Bill," as I'll call him, was an IBM employee who, from what I could gather, had only recently been assigned to the microcomputing

division. He was obviously extremely computer-literate and had even had some past experience with VisiCalc. Then there was me: first kid on my block to buy a PC, WordStar whiz but spreadsheet virgin, and notorious checkbook klutz. The other two students, Steve and Sam, were from the same firm; neither had ever touched a computer keyboard before. Just to make things even more challenging for Ken, Steve and Sam arrived for the session 20 minutes late, right after Ken had breezed through the introductory material that Bill and I already knew.

Ken handled the situation very sensibly and efficiently, giving Steve and Sam a crash fill-in while Bill and I got sent out for an early coffee break. Before we'd even emptied our cups, Ken came to fetch us. "I don't know how I got it all in in such a short amount of time," he confessed with a grin, "but I did." For the next few hours, Ken juggled our varying skills levels admirably. Since I was the person in the middle, I might not be the best judge, but from what I could observe, Sam and Steve seemed to be getting everything. Bill, too, seemed to avoid being dragged down by the rest of us, and was free to use time when the rest of us were working at various tasks to ask Ken about more advanced features of Multiplan.

At the outset, Ken told us he was employed by a firm called Computer Knowledge of Dallas. According to a sheet he handed out, the firm was "founded shortly after the IBM PC was announced" and "grew from one office with four people to three offices with fourteen people." Most of the staff seemed to come from mainframe data processing backgrounds.

Another sheet spelled out goals that the seminar aimed to provide for each student:

- An introduction to the concepts behind Multiplan
- An appreciation of the power and capabilities of Multiplan
- Exposure to a personal budget worksheet
- A working familiarity of most of the basic functions of Multiplan
- An intensive hands-on workshop to help firmly grasp the mechanics of Multiplan
- A comfort level which will encourage a student to return to the work environment to apply what's been learned

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The sheets bearing this information were part of a 75-page packet of what amounted to documentation for the seminar. (There was also a 20-odd page glossary, including not only relevant Multiplan terms, but the usual bug-byte-RAM ABCs and a few choice additions for the more advanced jargonist, such as concatenate.) Everything was printed up on loose sheets of standard size white paper with perforations for a three-ring notebook. Ken's M.O. was to go through the material chronologically, sometimes projecting an enlarged image of a particular page on a screen with an audiovisual machine. We followed along in our sheet packet, like a congregation keeping up with the service. The result was an awful lot of rustling and shuffling; I would have preferred to pay another \$5 for the seminar and have a notebook thrown in.

WE WERE
encouraged to "try some
illegal coordinates" so
that we'll know what
happens.

The course itself was divided into seven lessons, the first being the introductory segment on microcomputers in general and the PC in particular. Lesson II, "What is Multiplan?" began with a copy of a manually-produced worksheet—an actual 1976 monthly family budget written in Ken's wife's own handwriting. It was as homey and as familiar as could be, right down to the \$3.83 spent at McDonald's. (You might laugh, Chief, but I had been concerned that the instructor was going to start throwing around all kinds of managementese buzz words.) In general, Ken's persona was just about what you'd want in a teacher (or for that matter, a computer salesman): knowledgeable enough so that you know you're not wasting your money, but definitely "user-friendly." He encouraged questions and handled them all with respect.

Lesson II goes on to list all the things that a person can't do with a manual worksheet, such as the calculation of "what if" questions. Lesson III, "Some Basic Infor-

mation Before You Begin," defines and explains windows, diskettes and disk drives, and the IBM keyboard. (I liked the way that Ken described the Escape key as Multiplan's "get-out-of-trouble key.") The course outline/documentation included helpful pictures, as well as clearly written text. In fact, if I were IBM, I'd worry about people pirating the outline. (I haven't used the Multiplan disk tutorial that comes with the program, but I find the manual pretty intimidating.)

Lesson IV, "Using Multiplan," is essentially a lesson on how to turn on the PC and load software. Lesson V, "Learning the Basics," starts to get down to the nitty-gritty. Here we learned about the cells that comprise a worksheet, what kinds of information can be put into each cell, and how to move around the coordinates of the worksheet. We were even encouraged to "try some illegal coordinates" so that we'll know what happens. This is a wonderful antidote to computerphobia, since screwing up always turns out to be a lot less traumatic and less permanent than

one fears. We were also taught the difference between labels and values and how Multiplan knows the difference.

Lesson VI, "A Personal Budget Worksheet," begins by asking students to copy down a year's budget for a typical family—or at least a typical family that happens to own a boat. This gave us a chance to practice everything we'd just learned about moving around the worksheet. Then Ken showed us how to make Multiplan add up the family expenses and deduct them from income to calculate savings. We also learned how to make Multiplan enter the expenditures in all categories throughout the year so that we didn't have to repetitively key the information in ourselves.

Next, we pretended that we wanted to make a provision for the cost of food going up 1.5 percent a month, and we also made believe that Mr. or Ms. Boatowner is anticipating a raise in mid-year. We learned how to make Multiplan recalculate all the values and tell us how much more or less Boatowner can expect to put in the bank.

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CIRCLE 363 ON READER SERVICE CARD

Ken had us save what we'd done so far on a scratch diskette and then experiment with changing all the amounts in the budget. (Our written instructions read: "BE INVENTIVE. BE CREATIVE. PERSONALIZE THE WORKSHEET." I deleted the boat and made a budget with provisions for cat food, karate lessons, and Compu-Serve. I'll be honest with you, Chief: By now I was really having a good time.)

We weren't supposed to play with color until the last lesson, but none of us could resist, and Ken showed us how to combine the monitor's foreground and background shades to Multiplan's best advantage. (Sam went for the ergonomically sound amber on black, but the rest of us enchanted ourselves by creating punk spreadsheets of pink and charcoal and the like. Ken confessed that his favorite combo was the red and blue, since it reminded him of his perennial companion, the Diet Pepsi can.) The color made the information vastly easier to absorb. My guess is that IBM should sell more than a few color monitors as a result of these seminars.

During this same lesson we learned to invoke the program's "windows" (here the color was especially effective), and how to perform a variety of formatting

**WE WEREN'T
supposed to play with
color until the last
lesson, but none of us
could resist.**

tasks: changing column widths, rounding off numbers for a cleaner display, centering, and underlining. A coffee break followed, although all four of us hung around the room and played with the machines. Someone asked Ken to rate Multiplan against the other spreadsheets on the market. He diplomatically replied that it was against company policy to

endorse particular products, but acknowledged that the most "popular" program among his students seemed to be 1-2-3.

Ken told us that the goal of the course wasn't to drill into us everything that we ever wanted to know about Multiplan; the idea was to give us the tools to get started. He encouraged us, if we already owned Multiplan, to go back to our offices and start using it as soon as possible, while the seminar was fresh in our minds.

Lesson VII, "Advanced Features," was, not surprisingly, an overview. We were told how to print out a worksheet on the IBM printer, save work in progress, back up a diskette (on one drive), do an alphabetized sort, use the Help feature, "lock" data so that it can't be inadvertently written over, link several worksheets together, transfer data from old VisiCalc sheets, build a "small business model" similar to the simplified family budget we'd worked on earlier, and how to use two (count 'em) disk drives. My only problem with this section was my opinion that saving and backing up, while a pain, shouldn't be



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presented as an "advanced" feature.

Then we were told to clear our screens completely and, from scratch, put together a new budget. We all worked at our own pace, while Ken roamed around the room checking on our progress. I found this part of the seminar invaluable, since it compelled me to reinforce everything I'd just been taught. A few things that I'd thought I'd gotten the first time around had fallen through the sieve, and this time, I really learned them. I repeatedly made a few stupid mistakes. (I kept forgetting to enter the "alpha" mode when I wanted to enter an item. The Escape key bailed me out until I got over the mental hurdle.) The class had been conducted in such a manner to instill the confidence I needed to know that it was only a hurdle, not a brick wall. I hate to sound smug, Chief, but I learned that sucker, no doubt about it. I was ready for "Son of Multiplan."

After everyone filled out course evaluation forms and left, I donned my Burberry, whipped out my notebook, and informed the instructor that he'd been

"under surveillance" for the past 3½ hours. Could I ask him a couple of questions about why the course had been structured the way it was? Poor Ken! After being Mr. Mellow all afternoon, he suddenly became tongue-tied and begged for a chance to compose his thoughts. Well, I may be a hard-bitten reporter, but I have a soft sector, too. We made arrangements for

I INFORMED
the instructor that he'd
been "under
surveillance" for the
past 3½ hours.

him to call me within a few days.

Then a funny thing happened, Chief. Ken didn't call me back, or answer the messages I left at the Product Center.

Finally I tracked down Dave Barrie, the president of Computer Knowledge in Dallas. He admitted that they'd been "avoiding" me, but apologetically explained that Computer Knowledge had just signed a contract to continue giving the seminars for IBM, and that the contract forbids talking to the press without IBM supervision. There wasn't any way to cut through all the red tape before my deadline, Chief, so I never found out the answers to all my burning questions. If there's ever an IBM-gate, we're going to have to find our very own Deep Disk.

That's all, Chief, except that I want you to know that I'm no longer keeping my expense account records on the backs of scraps of paper in my wallet. I have a "system," just like all the other small businesses, with cells and coordinates and labels and values and all that stuff. Now about that \$95 you owe me. . . . /PC

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CIRCLE 156 ON READER SERVICE CARD

ATTENTION DEALERS:
Call today to find out more
about our dealer program

Three days in the rat's mouth: IBM's Boca Raton Training School instructs service technicians in the rigors of PC repair.

How Boca Does It

Boca Raton. To the PC user, the very name suggests Mecca, the wellspring, the place where all is known (though little is revealed), and programs never crash. Service technicians trained by IBM may have a different view, for here they learn the rigors of PC repair. Hallowed halls of ivy? Hardly. "Antiseptic classrooms" and "state-of-the-art audiovisual training techniques" are more apt descriptions.

I visited IBM's training center to find out firsthand what the technical training courses were like. When the technician at the local computer store can't fix your PC, who is to blame? The technician? IBM? The store? One thing that can't be blamed is the training course.

The Service Technician Course, as it is called, is a 3-day affair. It is broken down into six categories: Product Overview, Hardware Manual Descriptions, Removal and Replacement Procedures, Warranty Terms and Conditions, Parts Ordering Procedures, and Diagnostic Techniques.

I spoke with a number of the technicians taking the course, including instructors Rick Black and Doug Mabery, and Nick Nicholson, who is in charge of service training. As Nick puts it, they have

two objectives: maximum customer satisfaction and minimum customer downtime. These two factors have dictated not only the structure and content of the course, but even the actual design of the PC. Speed in getting a malfunctioning PC back on line is everything. The main focus of the course is warranty and service-contract repair via field replacement of defective components. The diagnostic techniques taught are limited to those in the Advanced Diagnostics Disk and Manual.

***THE
requirement that the
dealership make an
investment in the
training is intentional.***

Students work in pairs; each work station is equipped with a standard PC, printer, and monochrome monitor. IBM provides a set of basic tools that includes

nothing more complex than a volt-ohm meter. While IBM foots the bill for the training for the first two people from each dealership, the dealer is responsible for travel, lodging, and other expenses. The requirement that the dealership make an investment in the training is intentional. Third-party service organizations and large companies with in-house service organizations may also send someone, but for them, the tab is \$180 per day for the training. Nick emphasized that the third-party servicers were not permitted to do warranty repairs. He also said that he had turned down many requests for training on repairs at the component level—actually troubleshooting the boards. As it stands now, the only way PCs are serviced is through swap-out of defective modules. Third-party servicers stand to make more money by repairing their own boards rather than buying them from IBM, but Big Blue then loses quality control over the resulting product.

The only criteria for acceptance into the course are that the attendee should be the store technician and that he have some familiarity with hand tools and simple instruments. Some of the people who

attend are the store owners or managers, either because they have not yet hired a technician, or because they will be teaching the person or doing some of the work themselves.

So what is it like attending IBM service school? The first impression is one of preparedness; nothing is left to chance in the organization, equipment, facilities, and training aids. Even with 22 students, the room is spacious, and would still be so if filled to its capacity of 30. It is thoughtfully divided into smoking and nonsmoking sections. One instructor, Bill Lanning, leads the class at the front of the room, while two more, Vito and Sally, circulate, looking over shoulders, offering tips or words of encouragement. The atmosphere is casual, with bouts of straight technical information broken up by the light banter and good-natured barbs exchanged among the instructors. Today Vito is the target, and the students are cautioned that all problems they may encounter are somehow attributable to him.

"We like to keep it light," says Rick.

"People remember more when they're having a good time." The "training" film that introduces a coffee break is a short feature in which a Cookie Monster-like

ONE COMMENT
read, Rick enjoyed the
third day too much.

puppet devours a computerized coffee machine piece by piece as the machine explains each of its components in a robotic voice. As he downs the last morsel, the voice echoes from within the monster, "... of course, I am equipped with an antitampering device that causes detonation of a high explosive upon detection." Kaboom. Time for coffee.

IBM's School Top Quality

Chatting with the technicians, I had a

chance to get some of their impressions of the course. Most were under 30, all were male, and the majority had at least some previous interest in electronics and computers. A few had PCs of their own. One was a store owner.

Some of them had been to other manufacturers' training programs; a number of them had been to Apple school. By comparison, they felt that Apple's methods were very laid back, perhaps too much so. One technician commented that there was too much reliance on videotape see-and-do and not enough personal interaction. Another gave high marks to Compaq's training session, while a third said that Fortune's people "were the sharpest he had yet come in contact with." All agreed, however, that IBM's school was top quality. I asked them if the PC had any recurring problems or any that were particularly tough to solve. None could think of any. One said that his shop generally turned PCs around in a day, and some were fixed while the customer waited.

Back in the classroom, Bill Lanning is

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up front, pointing at a screen showing the innards of a printer. An overhead projector shows a detailed drawing of the same area. Under Bill's direction, a dozen printers are progressively disemboweled by pairs of students working together. Two other instructors circulate, offering help where needed. One technician has his computer completely disassembled and is toying idly with some gears. "These things are all pretty much the same inside," he says.

Varying Levels of Expertise

It becomes apparent that there is a considerable range of experience and manual dexterity within the group. One student fumbles to insert a small screw in a tight spot, while another reaches for the forceps in his tool kit and expertly guides in the screw. The instructors do a good job of smoothing out the differences in ability and keeping the class together. They use the hitches that students encounter as lessons in what can go wrong, without embarrassing anyone. Similarly, they pick

up tricks and techniques, and pass them around to all. Someone holds up a part that no longer wants to go back inside the machine. "Vito must have gotten hold of that one," comments Lanning.

Before long, all the printers are back together and working again. There is a palpable sense of camaraderie in the room. It's a nice place to be. "Some of our stu-

AT LEAST
*you don't need metric
and fractional wrenches
if you use an
adjustable.*

dents are disappointed that we don't get into the bits and bytes," said Doug Mabery. "We really can't help them." He added, "One of the guys who came in recently

was qualified to design the machine, never mind fix it."

Technicians who have the expertise and the interest can always obtain manuals for some of the more complex components such as disk drives. As the cost of the components comes down, however, and the price of labor goes up, even simple repairs such as head alignment will not be done in stores. Also, many stores are reluctant to invest in more advanced test equipment, such as an oscilloscope. As it stands now, the process of fixing a PC is first diagnosis, followed by the mechanical act of swapping out the bad component. IBM actively discourages attempts to repair certain parts, such as the System Board. Since it is multilayer in construction, it is extremely difficult to solder properly.

On the other hand, some of the attendees are complete neophytes and have hardly even seen a computer before, let alone repaired one. Rick and Doug are particularly proud of the group of farmers who bought a bunch of PCs to run farm

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CIRCLE 129 ON READER SERVICE CARD

PC MAGAZINE 113 AUGUST 1983

management programs. For a number of reasons, some of them would be servicing their own equipment and therefore were attending the service class. The trouble was, none of them had laid hands on a computer before, nor did they have any electronic skills. Through the training program and a little extra TLC, they went from being utterly intimidated to fully competent in caring for and troubleshooting their machines.

The third day is "Debug Day." The instructors "break" all the PCs, then provide about the same level of helpful information that the technician can expect from the least knowledgeable customer—"It doesn't work," they say.

Each instructor has his favorite curve balls to keep students on their toes. One misconnects a jumper, another wires something backward, and another provides a faulty diagnostics disk. A few technicians have heard of this particular scheme and bring their own diagnostics disks. A surreptitious pass with a magnet is the great equalizer. This is not as it

might seem, a mean gesture on the instructor's part; a defective machine can "eat" every bootable disk in the place if the technician doesn't tumble to it right away. The

Nothing is left to chance.

name of the game is thoroughness and adherence to the sequences laid out in the *Diagnostics Manual*. A machine boots and the pair of technicians rejoices. "That machine is still broken," says an instructor. The crestfallen pair of students continues, perhaps to find a bad RAM chip or an inoperative async card.

Finally, it's "graduation day." To date, no one has "failed" the course, but store managers have occasionally been informed that IBMers felt a technician could use more training or coaching. Comments

are encouraged and student response questionnaires are correlated against instructor evaluation sheets to keep perceptions in balance. One comment read, "Rick enjoyed the third day too much."

Training Updates

IBM keeps a database on everyone who has been to the school and routinely compares students' names to those appearing on warranty repair authorizations. The individual stores are monitored by Program Managers, IBM's field reps who maintain contact and support for the retail dealers. They ensure that only IBM-trained technicians perform warranty and authorized service work. As part of the quality-control process, they track down repairs to the component level.

There are levels of formal and informal followup to make sure that the service network is doing its job. Customer satisfaction surveys are compared with polls taken by internal and external consultants. At present, customers seem to be quite satisfied. The largest problems seem to stem

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CIRCLE 417 ON READER SERVICE CARD

from connecting non-IBM products to the PC. Printers and multifunction cards lead the list in this category.

After training is over, dealerships receive newsletters and training updates. These help keep the training fresh. A recent case in point was the PC-XT. Each qualified technician received a computer-aided instruction packet and a set of manuals for the new machine. From time to time bulletins come out on new software that may affect the technician.

Was there anything I didn't like about the training? Sometimes it was too simplified: The recommended technique for removing the front rail of the printer was documented in a slide that showed someone loosening the retaining nut with an adjustable wrench. Now I've always been taught that an adjustable wrench is appropriate only when you can't find a pair of pliers to round the nut with. I asked Rick and Doug about this, and they replied that while more tools might do a better job, they preferred using as few tools as possible. Oh well, at least you don't need metric

and fractional wrenches if you use an adjustable. After all is said and done, the course produces a technician qualified to perform diagnosis and replacement of faulty parts in a PC. He does not, however, know any more about it than an astute owner who has read the technical manual carefully. In fact, unless he has an active interest in the internal workings, he may

ONE OF
*the guys who came in
recently was qualified
to design the machine,
never mind fix it.*

know less about software doings than an experienced user.

I talked with Doug and Rick afterwards and asked them if there were any tips that I

could pass along to our readers, to help them avoid needless service calls. "Read the manual," they said in unison. They also recommended that people exercise much more care in handling their disks. Rick recounted the story of one owner who kept work-in-progress disks handy by sticking them to a file cabinet with a magnet. He couldn't figure out why he was getting so many read errors. The instructors also felt that people pay far too little attention to cleanliness and keeping fingers away from the magnetic medium.

"What about the keyboard's predilection for flaky operation when it picks up dust?" I asked. Rick thought for a moment as he flicked his cigarette in the general direction of the ashtray on the far side of his keyboard. "Go ahead, Rick, show him," said Doug. Rick picked up the keyboard by its back edge, held it vertically, then rapped the front edge hard on the desktop. "That'll do it," he smiled. "Of course, we don't recommend this technique for the System Unit or monitor."

/PC

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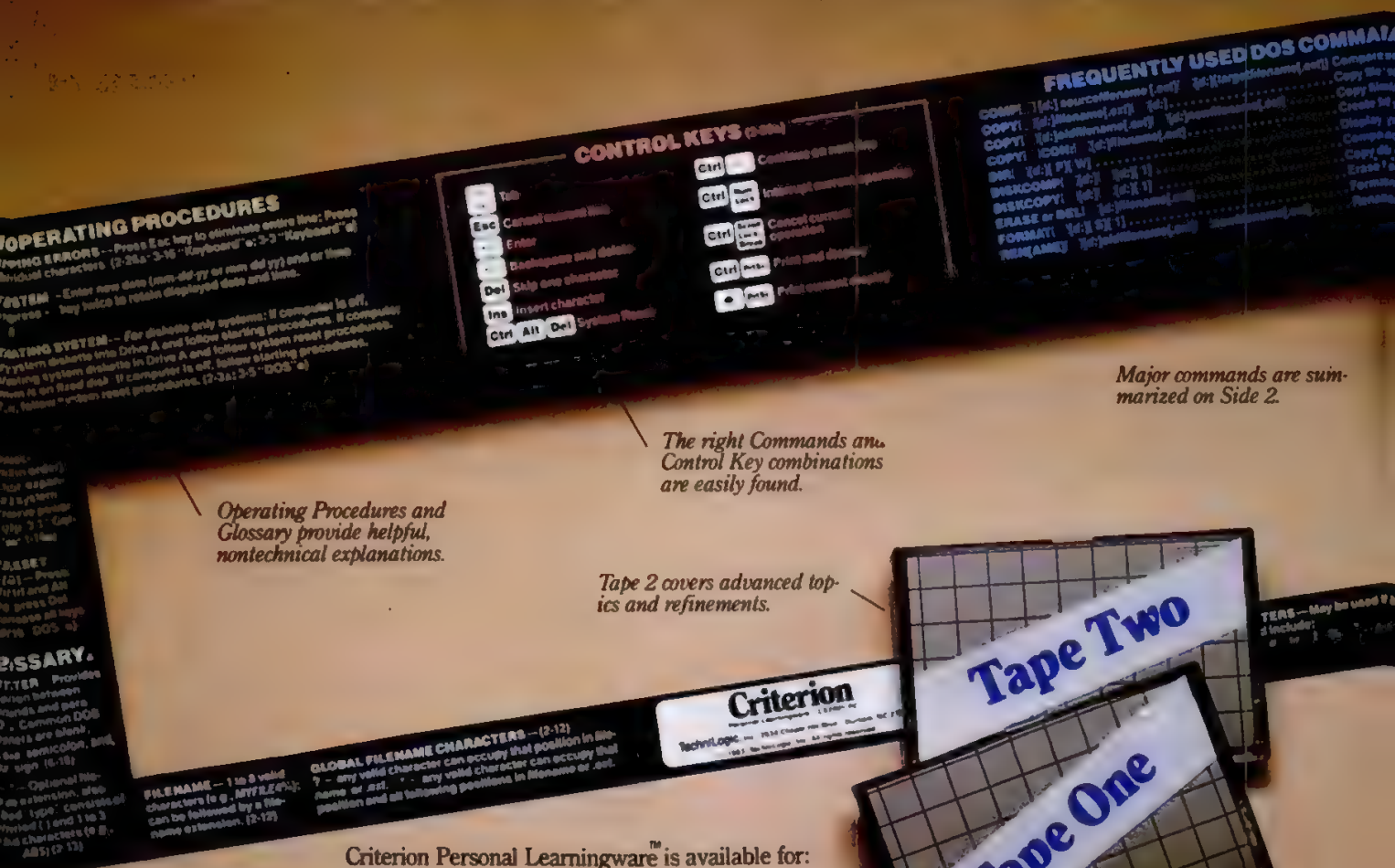
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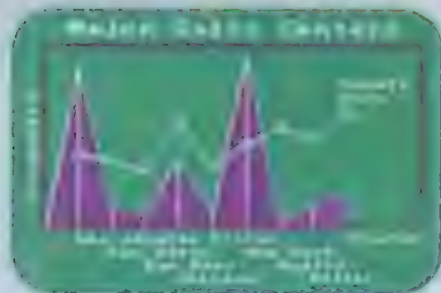
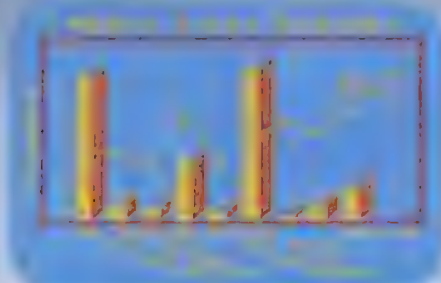
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PHILADELPHIA	7,500,000	\$7,500	\$7,500
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PORTLAND	5,500,000	\$5,500	\$5,500
SEATTLE	4,500,000	\$4,500	\$4,500
DENVER	3,500,000	\$3,500	\$3,500
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MINNEAPOLIS	0.00005	\$0.00000005	\$0.00000005
ATLANTA	0.000025	\$0.000000025	\$0.000000025
ST. LOUIS	0.00001	\$0.00000001	\$0.00000001
NEW ORLEANS	0.000005	\$0.000000005	\$0.000000005
MEMPHIS	0.000002	\$0.000000002	\$0.000000002
INDIANAPOLIS	0.000001	\$0.000000001	\$0.000000001
PORTLAND	0.0000005	\$0.0000000005	\$0.0000000005
SEATTLE	0.00000025	\$0.00000000025	\$0.00000000025
DENVER	0.0000001	\$0.0000000001	\$0.0000000001
MINNEAPOLIS	0.00000005	\$0.00000000005	\$0.00000000005
ATLANTA	0.000000025	\$0.000000000025	\$0.000000000025
ST. LOUIS	0.00000001	\$0.00000000001	\$0.00000000001
NEW ORLEANS	0.000000005	\$0.000000000005	\$0.000000000005
MEMPHIS	0.000000002	\$0.000000000002	\$0.000000000002
INDIANAPOLIS	0.000000001	\$0.000000000001	\$0.000000000001
PORTLAND	0.0000000005	\$0.0000000000005	\$0.0000000000005
SEATTLE	0.00000000025	\$0.00000000000025	\$0.00000000000025
DENVER	0.0000000001	\$0.0000000000001	\$0.0000000000001
MINNEAPOLIS	0.00000000005	\$0.00000000000005	\$0.00000000000005
ATLANTA	0.000000000025	\$0.000000000000025	\$0.000000000000025
ST. LOUIS	0.00000000001	\$0.00000000000001	\$0.00000000000001
NEW ORLEANS	0.000000000005	\$0.000000000000005	\$0.000000000000005
MEMPHIS	0.000000000002	\$0.000000000000002	\$0.000000000000002
INDIANAPOLIS	0.000000000001	\$0.000000000000001	\$0.000000000000001
PORTLAND	0.0000000000005	\$0.0000000000000005	\$0.0000000000000005
SEATTLE	0.00000000000025	\$0.00000000000000025	\$0.00000000000000025
DENVER	0.0000000000001	\$0.0000000000000001	\$0.0000000000000001
MINNEAPOLIS	0.00000000000005	\$0.00000000000000005	\$0.00000000000000005
ATLANTA	0.000000000000025	\$0.000000000000000025	\$0.000000000000000025
ST. LOUIS	0.00000000000001	\$0.00000000000000001	\$0.00000000000000001
NEW ORLEANS	0.000000000000005	\$0.000000000000000005	\$0.000000000000000005
MEMPHIS	0.000000000000002	\$0.000000000000000002	\$0.000000000000000002
INDIANAPOLIS	0.000000000000001	\$0.000000000000000001	\$0.000000000000000001
PORTLAND	0.0000000000000005	\$0.0000000000000000005	\$0.0000000000000000005
SEATTLE	0.00000000000000025	\$0.00000000000000000025	\$0.00000000000000000025
DENVER	0.0000000000000001	\$0.0000000000000000001	\$0.0000000000000000001
MINNEAPOLIS	0.00000000000000005	\$0.00000000000000000005	\$0.00000000000000000005
ATLANTA	0.000000000000000025	\$0.000000000000000000025	\$0.000000000000000000025
ST. LOUIS	0.00000000000000001	\$0.00000000000000000001	\$0.00000000000000000001
NEW ORLEANS	0.000000000000000005	\$0.000000000000000000005	\$0.000000000000000000005
MEMPHIS	0.000000000000000002	\$0.000000000000000000002	\$0.000000000000000000002
INDIANAPOLIS	0.000000000000000001	\$0.000000000000000000001	\$0.000000000000000000001
PORTLAND	0.0000000000000000005	\$0.0000000000000000000005	\$0.0000000000000000000005
SEATTLE	0.00000000000000000025	\$0.00000000000000000000025	\$0.00000000000000000000025
DENVER	0.0000000000000000001	\$0.0000000000000000000001	\$0.0000000000000000000001
MINNEAPOLIS	0.00000000000000000005	\$0.00000000000000000000005	\$0.00000000000000000000005
ATLANTA	0.000000000000000000025	\$0.000000000000000000000025	\$0.000000000000000000000025
ST. LOUIS	0.00000000000000000001	\$0.00000000000000000000001	\$0.00000000000000000000001
NEW ORLEANS	0.000000000000000000005	\$0.000000000000000000000005	\$0.000000000000000000000005
MEMPHIS	0.000000000000000000002	\$0.000000000000000000000002	\$0.000000000000000000000002
INDIANAPOLIS	0.000000000000000000001	\$0.000000000000000000000001	\$0.000000000000000000000001
PORTLAND	0.0000000000000000000005	\$0.0000000000000000000000005	\$0.0000000000000000000000005
SEATTLE	0.00000000000000000000025	\$0.00000000000000000000000025	\$0.00000000000000000000000025
DENVER	0.0000000000000000000001	\$0.0000000000000000000000001	\$0.0000000000000000000000001
MINNEAPOLIS	0.00000000000000000000005	\$0.00000000000000000000000005	\$0.00000000000000000000000005
ATLANTA	0.000000000000000000000025	\$0.000000000000000000000000025	\$0.000000000000000000000000025
ST. LOUIS	0.00000000000000000000001	\$0.00000000000000000000000001	\$0.00000000000000000000000001
NEW ORLEANS	0.000000000000000000000005	\$0.000000000000000000000000005	\$0.000000000000000000000000005
MEMPHIS	0.000000000000000000000002	\$0.000000000000000000000000002	\$0.000000000000000000000000002
INDIANAPOLIS	0.000000000000000000000001	\$0.000000000000000000000000001	\$0.000000000000000000000000001
PORTLAND	0.0000000000000000000000005	\$0.0000000000000000000000000005	\$0.0000000000000000000000000005
SEATTLE	0.00000000000000000000000025	\$0.00000000000000000000000000025	\$0.00000000000000000000000000025
DENVER	0.0000000000000000000000001	\$0.0000000000000000000000000001	\$0.0000000000000000000000000001
MINNEAPOLIS	0.00000000000000000000000005	\$0.00000000000000000000000000005	\$0.00000000000000000000000000005
ATLANTA	0.000000000000000000000000025	\$0.000000000000000000000000000025	\$0.000000000000000000000000000025
ST. LOUIS	0.00000000000000000000000001	\$0.00000000000000000000000000001	\$0.00000000000000000000000000001
NEW ORLEANS	0.000000000000000000000000005	\$0.000000000000000000000000000005	\$0.000000000000000000000000000005
MEMPHIS	0.000000000000000000000000002	\$0.000000000000000000000000000002	\$0.000000000000000000000000000002
INDIANAPOLIS	0.000000000000000000000000001	\$0.000000000000000000000000000001	\$0.000000000000000000000000000001
PORTLAND	0.0000000000000000000000000005	\$0.0000000000000000000000000000005	\$0.0000000000000000000000000000005
SEATTLE	0.00000000000000000000000000025	\$0.00000000000000000000000000000025	\$0.00000000000000000000000000000025
DENVER	0.0000000000000000000000000001	\$0.0000000000000000000000000000001	\$0.0000000000000000000000000000001
MINNEAPOLIS	0.00000000000000000000000000005	\$0.00000000000000000000000000000005	\$0.00000000000000000000000000000005
ATLANTA	0.000000000000000000000000000025	\$0.000000000000000000000000000000025	\$0.000000000000000000000000000000025
ST. LOUIS	0.00000000000000000000000000001	\$0.00000000000000000000000000000001	\$0.00000000000000000000000000000001
NEW ORLEANS	0.000000000000000000000000000005	\$0.000000000000000000000000000000005	\$0.000000000000000000000000000000005
MEMPHIS	0.000000000000000000000000000002	\$0.00000000000000000000000000000002	\$0.00000000000000000000000000000002
INDIANAPOLIS	0.000000000000000000000000000001	\$0.00000000000000000000000000000001	\$0.00000000000000000000000000000001
PORTLAND	0.0000000000000000000000000000005	\$0.000000000000000000000000000000005	\$0.000000000000000000000000000000005
SEATTLE	0.00000000000000000000000000000025	\$0.0000000000000000000000000000000025	\$0.0000000000000000000000000000000025
DENVER	0.0000000000000000000000000000001	\$0.00000000000000000000000000000001	\$0.00000000000000000000000000000001
MINNEAPOLIS	0.00000000000000000000000000000005	\$0.0000000000000000000000000000000005	\$0.0000000000000000000000000000000005
ATLANTA	0.000000000000000000000000000000025	\$0.0000000000000000000000000000000025	\$0.0000000000000000000000000000000025
ST. LOUIS	0.00000000000000000000000000000001	\$0.00000000000000000000000000000001	\$0.00000000000000000000000000000001

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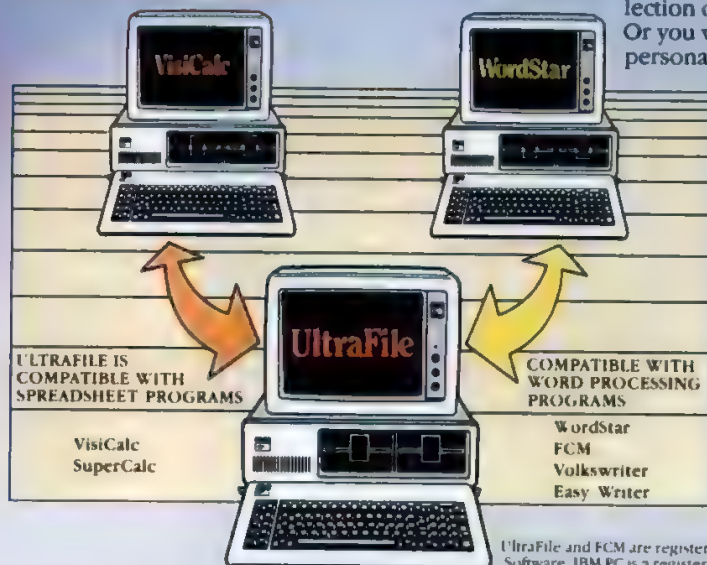
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Straight talk about printers

Call for Prices

An inconvenience? Sometimes. We post the "call for prices" because manufacturers demand it...it also lets us continue to offer High Technology At Affordable Prices. In fact, it makes sense to call anyway since our prices do change, usually for the better. Call toll free, (800) 343-0726.

Dot Matrix Printers

Since an IBM PC can drive almost any parallel printer on the market, software compatibility is critical. Remember, too, that no printer is 100% compatible with the PC except the PC printer—Epson, Gemini, Okidata & Mannesmann Tally printers are the next best things.

EPSON

FX, RX & MX



The **FX-80** features 160 cps, a correspondence font & a new body (tractor is optional), in addition to all the features normally found on the old **MX Series**, which is being phased out. (The **FX-100** is the 136 column version).

The **RX Series**, which replaces the **MX**, offers 100 cps print speeds, but nothing more remarkable. Call for the latest version & the best prices.

C. ITOH

Prowriter



C. Itoh has produced a winner. The **Prowriter** has speed (120 cps), a buffer (1.5K), 10, 12, & 16 cpi (plus a correspondence font) and graphics (160x144 dpi). It's the printer of choice for several major OEMs. The **Prowriter 2** has the same specs, but in a 132 column format. Popularity is may be its only curse: the **Prowriter** can sometimes be hard to keep in stock.

Prowriter \$399.88
Prowriter 2 \$719.88

STAR MICRONICS

Gemini 10X/15

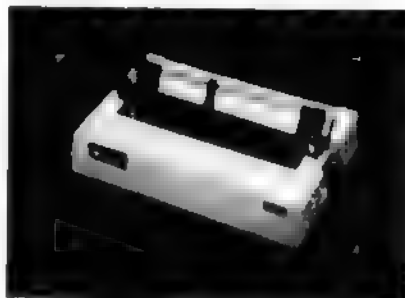


Gemini 10X is a new release of an old favorite. The 120 cps is the big change. They dropped the pro-

portional font, but kept the correspondence font. The 120x144 dpi, 5 fonts (w/italics) & 1K buffer are standard. **Gemini's** comes with tractors & uses plain spool ribbons. The **Gemini 15** is the 132 column version, & it has the correspondence font. Call for the latest & greatest in prices.

OKIDATA

Microline Series



We use these printers in our offices. The **Microline 82A** (80 col) & **83A** (132 col) are data crunchers, with two interfaces (parallel or RS-232C), 120 cps, 10 & 16 cpi (w/double-width) & optional dot-addressable graphics.

The **Microline 92** (80 col) & **93** (132 col) are ideal for word processing. They offer a 160 cps draft mode, a 40 cps correspondence mode & the dot-addressable graphics are included.

The **Microline 84** (132 col) combines speed (200 cps) with 10, 12, 16 cpi (w/double-width), all with a correspondence mode, plus dot addressable graphics.

Microline 82A \$419.88
Microline 83A \$679.88
92/82A Tractor \$59.88
82A/83A ROM \$49.88
Microline 92 \$524.88
Microline 93 \$884.88
Microline 84 \$1024.88

MANNESMANN TALLY

MT-160 L



The **MT-160 L** is the newest of the correspondence quality printers. It has speed (160 cps), 8 fonts (including a correspondence font), parallel & serial interfaces, friction/tractor feed, plus a menu-driven installation for easy set-up from the control panel—no more digging around for dip switches. It's remarkably compact & efficient, & the print quality is superior. This year's sleeper. The **MT-160 L** is the 136 column version.

MT-160 L \$689.88
MT-160 L \$CALL

We sell other dot matrix printers, including the **Anadex WP-6000**, **DP-9501**, **DP-9620** & **DP-9625** & **IDS's Prism 80**, **Prism 132** & **MicroPrism**. You can call (800) 343-0726 for technical details. For prices, or to order, call (800) 343-0726.

Letter-Quality Printers

Letter-quality printers are business machines, & very high-ticket ones at that. Most individuals should buy a dot matrix first, adding letter-quality when it's needed.

C. ITOH

Starwriter



The **Starwriter**, released last year by C. Itoh, has proven a worthy printer. You don't trade-off speed for price or quality. The **Starwriter** uses Diablo code, wheels & ribbons, has a 40 cps print speed, 1/48" line space, 1/120" horizontal spacing—ideal for proportional modes. (For real speed freaks, there's the **Printmaster**, at 55 cps. Same specs as above.)

Starwriter Parallel \$1219.88
Printmaster Parallel \$1679.88

DATA TERMINALS & COMMUNICATIONS

DTC 380Z



The **380Z** is a letter-quality printer that rivals and replaces the Daisywriter 2000. It has the 48K buffer, true Diablo emulation & uses the Brother/Daisywriter supplies. The documentation is great, & the **380Z** even has pin-outs on the back for easy interfacing (parallel or RS-232C). Eat your heart out Daisy!

DTC 380Z (Parallel) \$1119.88

SILVER REED

EXP-550



Why buy a Transtar when you can buy from the guys who make them? The **Silver Reed EXP-550** is a 16 cps, 132 column letter-quality printer with true Diablo emulation, making it compatible with most word processing software. It's ideal for medium duty office work. Add a buffer & you'll have a versatile printing system. If speed's not a factor, the **EXP-500** at 12 cps (80 col) is available as well.

EXP-550 (Parallel) \$719.88
EXP-550 (Parallel) \$459.88

SMITH-CORONA

TP-1



The **TP-1** is an ideal second printer for small offices or homes. The tractor

feed (now available) enhances its paper handling. If you're letter-quality needs are light, this might be the machine. (Specify 10 or 12 cpi when you order.)

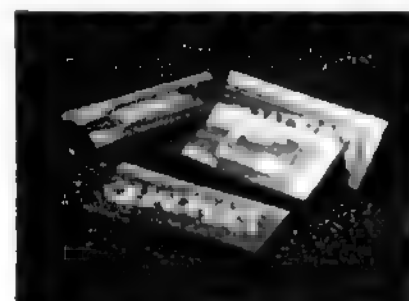
TP-1 \$CALL
TP-2 \$CALL

We sell a variety of other letter-quality printers, including the **Comrex ComRiter**, **Diablo 620** & **630**, the **NEC 3530**, **3550** & **7730**, the **Qume 11+** & many others. Call (800) 343-0726 for technical details. For prices, or to order, call (800) 343-0726.

Accessories

QUADRAM

Microfazer

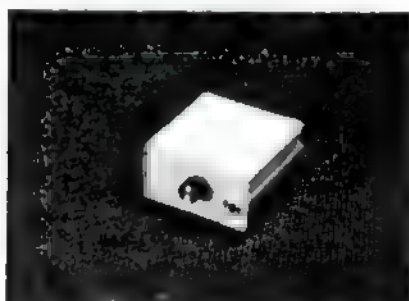


Quadram's **Microfazer** is a stand-alone buffer that can be expanded to 512K—that's about 200 pages. External buffers can be moved from system to system, & they leave your PC memory free. The copy feature lets you print unlimited copies of a document. Comes with its own cable. The power supply is optional.

8K parallel/parallel \$154.88
64K parallel/parallel \$219.88
256K parallel/parallel \$629.88
512K parallel/parallel \$979.88
9 Volt Power Supply \$19.88

TBL PRODUCTS

Printer Switch



We finally found a printer switch box that we like. Switch between two printers, in parallel/parallel or serial/serial versions (all female plugs).

2-Way Printer Switch \$119.88

UNIVERSAL OUTPUT SUPPLY

Printer Paper

Our pin-fed fanfold paper is 20lb white bond, shipped in a sturdy case. There are two sizes: 9 1/2" & 14 1/2". The wider paper also comes in green-bar.

Paper (9 1/2") \$44.88
Paper (14 1/2") \$49.88

LEADING EDGE

Diskettes

We use these disks in the office. The **Elephant Memory Systems 5 1/4" Diskettes** come 10 to the box. We also carry the "trunks" (read disk boxes), which hold 60 diskettes. 8" disks & trunks are also available.

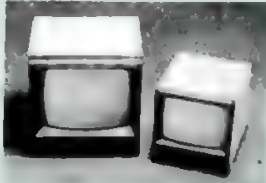
5 1/4" Double-Sided, Double-Density (IBM PC Compatible) \$32.88
5 1/4" SSD \$27.88
5 1/4" Trunks \$24.88

Monitors

Most people know by now that IBM's monochrome monitor doesn't do graphics. If you need them, consider getting the Color/Graphics Card. The card & monitor cost less than the monochrome outfit. Add a Quad-board & you're in business.

USI

Pi Series



Our love affair with the **Pi 3** amber monitor continues. The consensus is yes, amber is easier on the eyes in the long run. So is the **Pi-3's** 20MHz bandwidth and sharp, clear phosphor. Comes in 9 or 12", & in green Pi-2 (12" green)..... **\$159.88**
Pi-3 (12" amber)..... **\$159.88**
Pi-4 (9" amber)..... **\$159.88**

QUADRAM

QuadChrome

The **QuadChrome** is one of the highest resolution RGBs available. 16 colors (using NEC's tube), 690 dots by 240 lines (480 non-interlaced), 15MHz bandwidth & more. The case is identical to IBM's & it comes with its own cable.
PGSHX-12..... **\$529.88**

PRINCETON GRAPHICS

HX-12

The **HX-12** has the same spec's as the **QuadChrome**. Same price too.
HX-12..... **\$529.88**

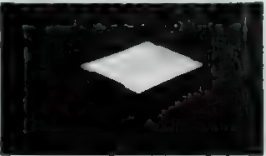
We also carry **Amdak 300G, 300A, Color 1, 2 & 3, the Electrohome 1302-1 & 1302-2 & Taxan's RGB-I, RGB-III, Green & Amber** monitors. Call (603) 881-9855 for technical details. To order call (800) 343-0726.

Modems

Internal? External? 300 baud? 1200? Only you can answer these questions. 1200 baud makes sense if you're on-line during the day. If you're at home, on-line late at night, 300 baud may be all you need. As always, research this stuff *before* you buy.

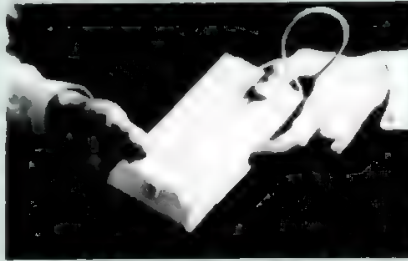
DC HAYES

Smartmodem



The **Smartmodem** is an originate/answer, auto dial/answer, full/half duplex modem. It comes in two versions: 0-300 baud or 0-300/1200 baud. Modular phone cable & power supply included. The RS-232C cable is optional.
Smartmodem (300 baud)..... **\$219.88**
Smartmodem (1200 baud)..... **\$539.88**

US Robotics Password \$379.88 UPS DELIVERED



An exceptional value for a 1200 baud modem. The **Password** is a direct connect originate/answer type modem with 0-300 & 1200 baud capability (Bell 212A compatible). Features include auto dial, auto answer, auto mode and auto speed select, full & half duplex (local echo), DTR override, RS-232C pins 2 & 3 reversible & audio phone line monitor. Single button operation makes the **Password** very easy to use. Comes with an RS-232C cable, power supply & modular telephone cable.

We also carry the **Novation** Series, including the **Smart Cat 1200 & 300** & the **US Robotics Auto Dial 212A**. Call (603) 881-9855 for technical details/specs. To order, call (800) 343-0726.

STANDARD MICROSYSTEMS

M-Term

M-Term is both communications software & a terminal package. Certified 2400 baud operation, terminal/command mode, repeat DOS command & direct file transfer. It supports the auto dial/answer features of the **USR Password**, the DC Hayes **Smartmodems** & **Novation's SmartCat**.
M-Term..... **\$79.88**

Peripherals

There are endless peripheral boards available, most of them copies or variations on the "quad" function board. There's also a lot of misinformation regarding peripheral boards & the IBM PC-XT. Fac is, most peripheral boards work on the XT out of the box—you don't need to upgrade the motherboard or alter it. Read your documentation carefully & watch out for "experts" in stores.

AST RESEARCH

Megaplus

The **Megaplus** packs an RS-232C ports, a parallel port, a clock & up to 256K RAM into only one slot. Comes with SuperDrive/Spooler software. You can add memory in 64K units up to 256K. **Megapak** is a 256K piggy-back card, giving you up to 512K on one board.
64K Megaplus..... **\$359.88**
256K Megaplus..... **\$509.88**
256K Megapak..... **\$329.88**

I/O+

The **I/O+** has a parallel port, two RS-232C ports, a game port & a clock, but no memory.
I/O+..... **\$199.88**
Connect All..... **\$24.88**



QUADRAM

Quadboards



We sell **Quadboards** because they consistently perform better than the competition. Quadram's one-year warranty, & an ongoing R&D into new products (see **QuadLink**) demonstrates their commitment to the PC marketplace.

Quadboards have a RS-232C port, a parallel port, a clock & memory, plus QuadSpool/Drive software.
Quadboard 64K..... **\$279.88**
Quadboard 256K..... **\$429.88**

Quad 512+s have a single RS-232C port on them, and sockets for up to 512K RAM. QuadSpool/Drive software included.
Quad 512+ (64K)..... **\$239.88**
Quad 512+ (256K)..... **\$399.88**
Quad 512+ (512K)..... **\$599.88**

Single Function Cards are single-duty cards only, as described below.
Parallel Card w/cable..... **\$69.88**
RS-232C Card..... **\$89.88**
Clock/Calendar Card..... **\$89.88**

QUADRAM

QuadLink

This is a real breakthrough! **QuadLink** lets you run Apple II/III software on the PC. It's like an Apple computer on one board, with 64K. Uses all PC printer/video ports. No disk conversion or reformatting required. Takes up only one slot.
QuadLink..... **\$349.88**

Disk Drives

Internal hard disk drives have one weakness: they can bring your whole system down if you have a problem. We suggest keeping the PC drives A & B intact, and using an external unit that can be detached should it need service.

Likewise, it's smart, if you're in a heavy production environment, to buy a floppy drive as a back-up to either drive A or B. The \$280 is cheap insurance against failure, & you can rotate them like tires to reduce mechanical wear.

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Big Blue runs CP/M 80 software. Parallel port, RS-232C port, clock, memory, hard disk interface & Z80 processor on board.
Big Blue..... **\$479.88**

IBM PC COMPATIBLE

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Single-sided..... **\$229.88**
Double-sided..... **\$279.88**

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Disk Controller

Perfect for bare-bones configurations. Handles two internals (A & B), plus two externals. Comes plain, with one parallel port or with one RS-232C port.

MFD Standard..... **\$159.88**
MFD w/Parallel..... **\$219.88**
MFD w/RS-232C..... **\$259.88**

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Sorry, we cannot accept open POs or extend credit/terms at these prices. APO and foreign orders are not accepted.

We prepared this ad in June & prices do change, so call to verify them.

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—J.C. Bartels, President
(accounting firm) Gonzales, Texas

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—Bob Cox, V.P. General Mgr.
(manufacturing company) San Antonio, Texas

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Accounts Receivable 1. Daily Transactions Report 2. Invoices (with or without preprinted forms) 3. Statements (with or without pre-printed forms) 4. Summary Aging Report 5. Detailed Aging Report 6. Itemized Monthly Transactions 7. Detailed Customer Activity Report 8. Summary Customer Account Report

Accounts Payable 1. Daily Voucher Report 2. Daily Credit Report 3. Checks with Detailed stubs 4. Check Register 5. General Ledger Transfer Report 6. Cash Requirements Report 7. Transaction Register 8. Open Voucher Report 9. Aged Payables Report 10. Detailed Vendor Activity Report 11. Summary Vendor Account Report

Payroll 1. Federal Tax Tables 2. State Tax Tables 3. Payroll checks with stubs 4. Payroll Check Register 5. Monthly Payroll Summary 6. Quarterly Payroll Summary 7. General Ledger Transfer Report 8. Detailed Employee File Listing 9. Produces 941 Worksheet 10. Prints annual W-2 Forms

System Requirements: Either CPM* or MS-DOS (PC-DOS) • Microsoft BASIC • 64K RAM • Two disk drives or hard disk • 132 column wide carriage printer, or an 8 1/2"x11" printer with compressed print mode (an Epson MX-80 or similar printer)

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Lotus Development Inc.

A veteran airline pilot prepares to launch a nationwide network of computer schools after test-flying his educational methods—based on flight instruction techniques—in southern California.

Computer Literacy: \$99 One-Way

You've just spent several thousand dollars on IBM PC equipment and software. You get the machine home or back to the office, set it up, plug it in, open the manual, and try to make some sense out of the instructions. And you're scared to death. You need help. But where? You don't have time to spend 4 years in college majoring in computer science, or 6 months at a trade school, or even a couple of weeks in a quick and dirty "Everything You Ever Wanted to Know About the PC" course—even if one were available. You've got maybe 2 or 3 days at best to spare.

If you live in southern California, you're in luck, there's Accelerated Com-

puter Training (ACT). The ACT School offers a course of study designed to let you test your computer wings in an intensive series of 1-day classes that cover everything from "What is a PC?" to WordStar.

On The Drawing Board

ACT, Inc., founded by commercial airline pilot Russ Furse in January 1982, is an instructional design company that has developed computer classes based on flight training methods.

Furse, a 16-year veteran on leave from a major airline, previously helped start up a general aviation ground school and a company that sells computer software. He was inspired to develop the ACT program during his own search for a computer school.

"I sold the software, but I didn't know much about computers," said Furse. "Unfortunately, most schools relied solely on the blackboard and chalk method." It struck him "like a ton of coal that somebody ought to develop a course package that would allow all these retailers and people who had been selling hardware and software to be able to train their customers."

After thinking over his initial idea, Furse decided "there ought to be a demand for stand-alone schools that were totally unbiased on what hardware or software you should buy—a school that would simply teach students how to use the hardware and software, and how to analyze which products to buy on their



own," and teach them quickly. But, instead of developing the school himself, Furse decided to develop the course materials so that the others could start their own schools and build their own facilities.

Within a few months Furse set out to create an educational package that would use proven, hands-on techniques, and prepared visual aids to deliver a curriculum including the most popular applications packages as well as programs favored by professional or business people.

Flight Plan

Once Furse decided to go ahead with ACT, Inc., he hired professional instructional designers who, with the aid of sub-

ject matter experts, developed a series of nine courses. Production people were hired, as well, to produce the slides, charts, and diagrams that were to be incorporated into the instructional designs.

In July 1982, ACT opened its first school in Culver City, California to use as a live platform to polish the product and prove that it worked. According to Furse, "The school was such an immediate success that we had people approaching us to buy that school and to buy other licenses even before all the courses were developed."

The nine courses, all of which are either 8 or 16 hours long, fall into three categories. The introductory course presents computer fundamentals to new

students in one day or two evenings. This hands-on "saturation" class covers computer lore and history, methodology for analyzing particular problems, and the selection of hardware and software. The second group includes the top selling business application packages such as WordStar, SuperCalc, VisiCalc, dBASE II. The third group covers programming: a 16-hour class on BASIC followed by a course in advanced programming using BASIC; and a class on dBASE II in programming mode.

The Pilots

"My original thought," said Furse, "was that we should go out and get somebody with a Masters or Ph.D. in computer

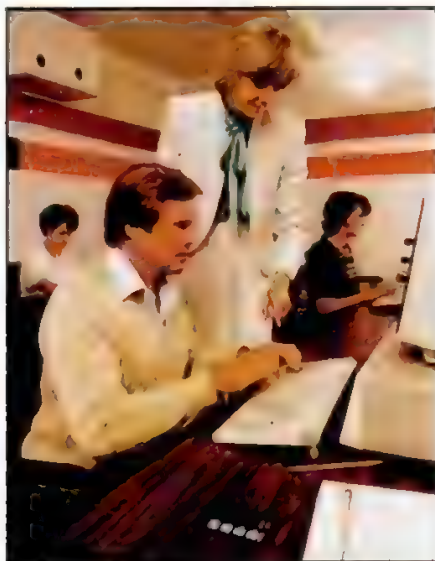
science." But as the development of the ACT package progressed, Furse realized that if he was going to produce a course and develop a package "where we were going to run the masses through and still make a profit, we couldn't justify spending the \$50 per hour for that type of instructor." And along the way he discovered that there was hardly a technical question the younger nondegreed instructors couldn't answer.

Furse found that the technical abilities of the 20- to 25-year-old instructors he hired equaled those of the computer science specialists. "The specialist may have worked on mainframes and may have more rounded experience, but on the specific hardware or software that we're using, the specialist may not be any better qualified than the 20- or 21-year-olds who are teaching the courses." And because the program package minimizes the effort required to train instructors, the duration of the training period would be no different for the specialist or the younger individual.

In addition to the cost factor, Furse believes that the young instructors bring a higher energy level and greater enthusiasm to their work, which is of course passed along to the students.

The Passengers

While one student—a housewife—listed herself as a "professional person with a direct link-up to her husband's office," most students at weekday classes



ACT instructor Mary Bradley coaches student through hands-on exercises.

are business people who have taken a day off from work to take a class. Students range in age from teenage home hobbyists to retired septuagenarians, with most students in their thirties or forties. Most classes are divided evenly between men and women.

Furse characterizes the majority of ACT students as highly motivated, relating their experience to that of pilots in training: "People who learn to fly are motivated because there is something in their blood that makes the idea of handling the controls of the airplane, doing something they wonder if they can really do, and proving to themselves that it is a task they can accomplish, very satisfying. It makes them feel good about themselves." He believes it's the same with computers, adding, "In flying, few people think they can actually use their ability as a pilot to make money. With computers, students really feel that mastering a Personal Computer can produce more for them in their professional lives.

As the lights dim in the carpeted classroom, 24 students are bathed in the glow of the 12 IBM PCs on four long tables. On either side of each computer, mounted in the table surface, is a "Responder Panel" containing four buttons marked A, B, C, D. The panels, which are linked to the instructor's lectern at the front of the room, enable him to ask questions and have each student respond by pushing a button. The instructor can then deal with student confusion without singling out an individual. The trick here is that only the instructor and the student know how well the student is doing. The system helps reduce the sense of intimidation students often experience, and allows the instructor to monitor all of his students. And depending upon the number of red or green lights on the instructor's panel, he can decide whether or not to proceed to a new subject or review the material just covered.

Cleared for Takeoff

What is remarkable about the ACT course is not the method used to teach the classes, but the fact that it wasn't developed before now. Furse's approach is surprisingly simple and effective.

At the beginning of each class, the young instructor distributes prepared notes for use during that session and for future reference. After an instructor



Russ Furse, an airline pilot, saw similarities in learning about computers and flying. He based Accelerated Computer Training, Inc. on his experience as a flight instructor.

spends 5 or 10 minutes discussing a subject and showing slides and other visuals he may have in the room, he questions the students—who answer via the responder panel. If, depending upon the number of correct responses, the instructor feels the class is with him, that the students understand the application under discussion, he leads them through the procedure on the PC itself. This procedure is displayed on the projection screen at the front of the room. The instructor leads the students through the various steps of the hands-on exercise, stopping along the way to answer questions.

By the end of the day, following a series of increasingly difficult tasks, and plenty of question and practice time, students are given particular labs to work on by themselves. The instructor circulates around the classroom offering assistance as needed.

Throughout the day, there are breaks during which students may rest. But, most often, they devote that free time to working on individual problems with the instructor, practicing on their own, or teaming up with other students on some of the new concepts they've just learned.

Turbulence

ACT differs dramatically from most microcomputer training courses. With quick and dirty training, people know there's lots of money to be made. They're throwing all sorts of stuff together and getting away with anything. The worst of these courses are the ones that use an out-

line and take whatever facts the instructors have in their heads and just spit them at students. They stand up there and lecture as hard and fast as they can and hope the students get it.

On Course

When skills are involved, you need an opportunity to practice, to do things and get feedback. When facts are involved, students need an opportunity to consider these facts and give them back to the instructor for some kind of response to find out whether they're on target. This methodology is the heart of the ACT approach.

***I** T'S THE SAME on a computer as it is in an airplane.*

In addition to well directed presentation and questioning, and plenty of hands-on practice, ACT instructors use a Socratic, or inductive, teaching style. Instructors lead students through a series of "prompting" questions that help them discover solutions to their own problems. This Socratic approach contrasts to the "flying fingers" approach so often seen in computer stores and other computer training courses. With the flying fingers method, an instructor looks at the student's screen to locate the problem, reaches past the student, and corrects the problem by entering the commands himself. The instructor may or may not explain the problem. The problem is fixed. And most likely the student learns nothing and feels intimidated.

The secret to ACT is that both the students and the instructors have fun. After a few hours at the computers, when the students begin to master their keyboards, they begin to experience "high flight," as Russ Furse calls it. "It's that heady feeling," said Furse, "you get from being above it all and from the exhilaration that you experience from being able to handle that machine by yourself." It's the same on a computer as it is in an airplane. That sense of accomplishment keeps students going as they begin to tackle more and

more complex tasks.

Hangar Flying

As the day progresses, students begin to share their experiences, make new friends, and help one another. This sharing is known as "hangar flying" in the aviation industry. As Furse explains, "While on the ground pilots quite often talk about their flying experiences and boast about them. Pilots love to hang around with other pilots and discuss their experiences, especially during the learning stage. This creates a common bond." Furse feels that it's the same with ACT students. The learning experience "creates a tremendous camaraderie. And that," according to Furse, "is what live instruction in the proper atmosphere can create. You can never get that out of a book or a floppy tutorial."

ACT courses are presently available only at two locations in southern California: Culver City and Irvine. Neither of these schools is owned by ACT; each pays a fee for the right to teach under the ACT imprimatur. ACT continues to hold the copyright for the training materials and methods it developed.

The company appears to be ready for expansion. According to Russ Furse, alternatives for acquiring venture capital including franchising, licensing, limited partnerships, and the sale of unissued ACT stock. A start-up operation in associ-

ation with ACT will probably cost in the neighborhood of \$150,000. The courses themselves presently cost \$99.

Considering the obstacles new users face in their search for instruction, it's not surprising that the ACT approach has proven popular. This kind of solution may help fill the training gap that manufacturers, merchandisers, and educational institutions are either unwilling or unprepared to fill.

By helping computer novices earn their wings, Russ Furse and ACT have also demonstrated that opportunities in the PC marketplace do not necessarily depend on inventing the newest IBM work-alike or developing the latest word processing program. Opportunity is in the eye of the beholder. True, it may help to have a view from 30,000 feet. /PC

For more information on ACT, write to Accelerated Computer Training, 6071 Bristol Parkway, #4, Culver City, CA 90230 (213) 215-3571.

Michael Greer, an instructional design consultant in Culver City, California, specializes in computer operator and application training. Eric Marcus is a freelance writer and owner of a New York walking tour company that focuses on the architecture and history of Manhattan.



ACT classroom in Irvine, California with Brian Hyde, facility director, and Russ Furse, ACT founder and president.

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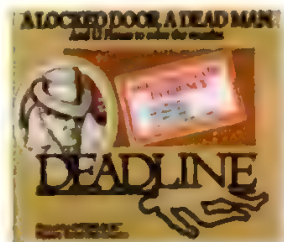
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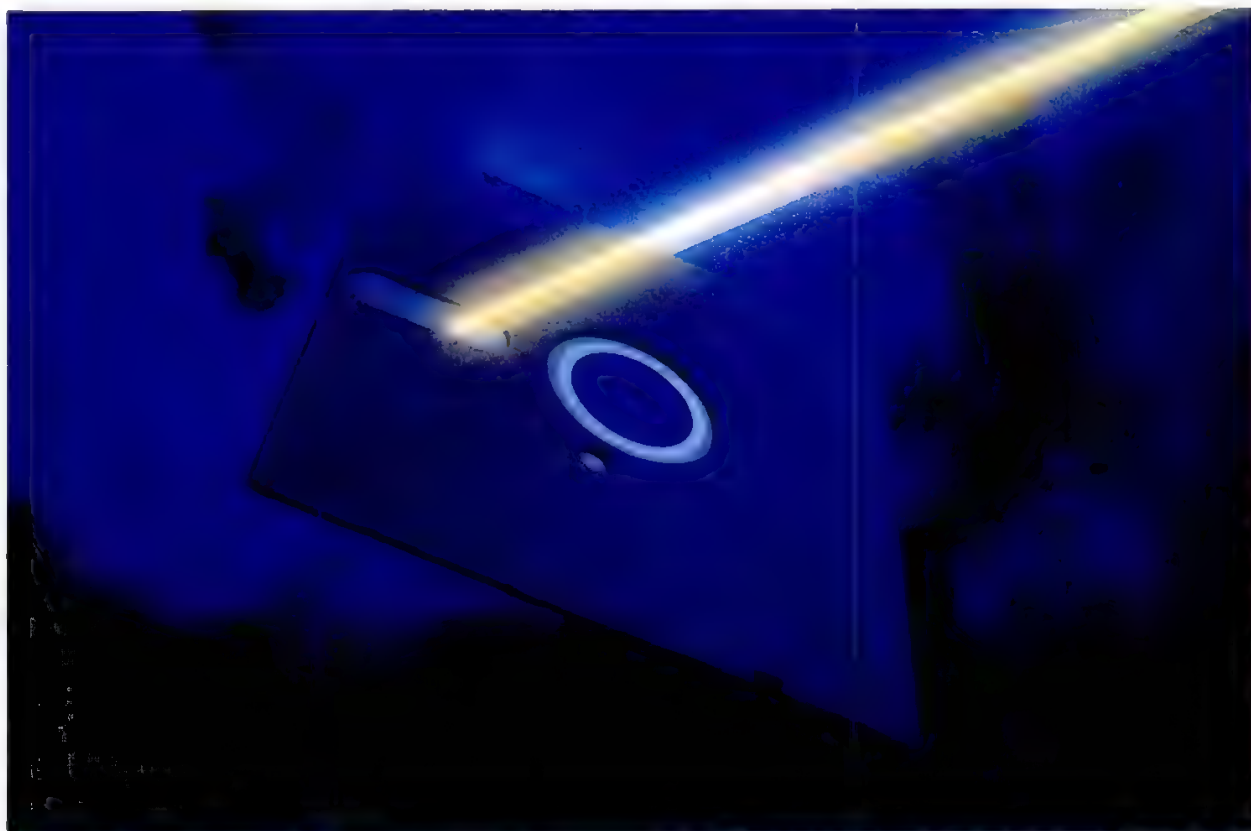
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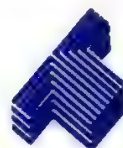
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TurboFile is currently available for the IBM Personal Computer, and is priced at \$195. For additional information call Creative Computer Applications, Inc. (603) 888-6648, or write PO Box 7074, Nashua, NH 03060. We're the ones who wrote VisiFile.

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CIRCLE 225 ON READER SERVICE CARD

A learn-by-doing advocate finally finds a kindred soul who reminds him of his spiritual mentor, the American philosopher, John Dewey.

Thumbs Up For Hands-On

American philosopher John Dewey thought humans learn best by doing. "You don't learn to play tennis by first reading about it in a book. Find a congenial companion, go to a tennis court, and get your hands on a racket. Flail around and make mistakes, and then, ask questions. Most of all, have fun. You're a learner and learning is fun," he might have said to someone who asked how to learn to play tennis. There is something elemental, existential, and very pure about Dewey's theory. And it works for me.

Many years ago, I bought an electric typewriter, put my hands on the keyboard, and set out to teach myself how to touch type. My typewriter came with a manual that showed, in nice, easy steps, how to touch type. But there is something ornery

in me that makes me rebel against following someone else's sequencing. I had to find my own sequence, so I didn't use the

PERHAPS I
*should have used the
manual more.*

manual much. I struggled, and looking back, I now realize that I may have struggled more than I had to; perhaps I should have used the manual more. Nevertheless, I became a good typist, and a fast and rea-

sonably-skilled writer.

Am I, however, an inefficient learner? Is my learning style—one consisting of an independent, stubborn impulse to make mistakes before turning to someone else for advice—stupid? John Dewey wouldn't think so, and I don't think so.

But when I decided that the time had come for me to take the computer plunge, my experience was a little like being told that I must not play tennis before I had read a book.

Understand that when I decided to buy a computer, I had a need for one. I wanted a powerful and fast word processor. My decision to buy a computer was logical, as I'd been doing more and more writing and enjoying success in placing articles with large national magazines.

Using my trusty typewriter had proved to me that I am very visual and that writing, for me, is like sketching words on paper. This approach requires constant revision, and one 10-page article easily consumes 100 sheets of paper and 20 hours of work. And most of the work is typing up new drafts. I'm fussy, and when

I make even the slightest change, I simply have to see what the change looks like in black and white. This means typing up a whole new page and, sometimes, more than one page.

I admit that I am often spontaneous and even impulsive. But I was unusually systematic about my decision to start word

processing. My first step was to register for a computer course at a local community college. I went to class with high hopes, eager to get my hands on a keyboard.

When I arrived, I found no computers, just a classroom with desks in rows. At the

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I'VE HEARD of dedicated baseball players and missionaries, but a dedicated machine?

front stood a friendly middle-aged man. I walked up to him and asked, "Where are the computers?"

"We use a textbook," he said.

"What are we going to learn?" I persisted.

"You'll learn all you'll need to know to use one."

"But isn't that a bit like learning how to play tennis by reading about it?" I asked, knowing John Dewey would have liked my question.

He frowned. "I never thought of it that way. I suppose you have a point. But a good grounding in the basics first can't hurt."

Unfortunately, that reminded me of another teacher who had told me I couldn't write until I learned what a subject and a predicate were.

Politely, I told him that I didn't think the course was for me, said good-bye, and withdrew.

Stranger in a Strange Land

Hungry, then, for hands-on experience, I decided to try computer stores. I'd browsed there from time to time, feeling a bit like an alien in the midst of all those people—salesmen and customers alike—who sat deeply engrossed in front of those magic machines. But now I was in earnest; in fact, I'd shifted money out of my savings account and had enough in my checking account to buy a computer.

John Dewey would have smiled at the salesmen I met. Oh, they knew their computers, but they didn't know much about learning. Or, about teaching.

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One thoroughly engaging and pleasant young fellow sat down in front of a sleek new model he called "fourth generation." "It has," he beamed, "the word processing built right into it. You can use it as soon as you take it out of its carton."

Hearing "fourth generation" didn't help my confidence much; it made me wonder where I'd been for the preceding three. But I was taken in by his enthusiasm and watched spellbound as he spent the next 15 minutes showing me how to use the shiny new machine. He was obviously having fun, and the merry, green electrons danced, just as I'd heard they would. I was, of course, dying to get my hands on that keyboard, but—and I swear this is true—he wouldn't let me touch it until he had finished his spiel about how this model was patterned after a very famous "dedicated word processor."

Now, cursed as I am by an ear for words and phrases, the word *dedicated* obsessed me. As he demonstrated all the wonderful features of this fourth-generation computer, my mind wandered off in search of *dedicated*. I've heard of *dedicated* baseball players and missionaries, but a *dedicated* machine?

I know now, of course, that it refers to a machine reserved for (or "dedicated to") a specific use. But I didn't know that then, and he assumed I did, which made me feel ignorant. Finally, perhaps tiring of all the fun he was having, the salesman arose

muttering to myself, "John Dewey, where are you?"

Try, Try Again

I found another computer store and met another young man who greeted me with "A new computer just walked in the door, and it's going to knock IBM clear out

HE WAS
*a dedicated computer
jock.*



NO, THAT'S
*not the way to do it.
Don't you remember
what I showed you?*

with a flourish from the keyboard and invited me to play with it. I'd forgotten all the maneuvers he'd shown me, of course. And when I called to him to help me, he came over and further depressed me by repeating, "No, that's not the way to do it. Don't you remember what I showed you?" As I fumbled helplessly, his voice took on a scolding tone, and suddenly, he reminded me of an over-critical teacher I'd had in the fourth grade. I experimented a little more in embarrassed silence. Then I left,

SCHEDULE, BUDGET AND TRACK YOUR PROJECTS . . . WITH JOBTRAX

JOBTRAX is a planning and monitoring tool for engineering, architectural and construction projects. You can easily budget, schedule, and plan manpower and resource requirements. Monitor project status with easy-to-read graphical reports and important status information. Includes CPM (Critical Path Method) scheduling. Built-in screen editor and data manager. \$345. See a demonstration at your dealer or contact OMICRON Software, 57 Executive Park, Suite 590, Atlanta, Georgia 30329, 404/325-0124.

JOBTRAX
By **Omicron**

CIRCLE 305 ON READER SERVICE CARD

of the water," he said.

I am not usually a literal-minded person. Fact is, I love metaphors. But instantly, I visualized what he'd just said. I saw a computer taking aim at IBM's New York skyscraper, which was inexplicably floating on the East River near the Brooklyn Bridge. Images from the movie *Star Wars* danced in my head.

But since I long ago learned that intelligent people only mix metaphors for comic effect, I didn't expect much from him; he was no comic. He was a dedicated computer jock who showed me hardware, including the "walking computer," all the while comparing each piece to IBM the way my dedicated jock friends compare the Chicago Cubs to the Los Angeles Dodgers. Who cares? I thought, as I headed for the public library with IBM ringing in my ears more than the salesman ever would have wished.

I needed some information, or, as the computer folks say, data. I pulled out a popular magazine featuring a run-down, complete with photographs, of personal computers.

I knew exactly what I wanted. I wanted a computer that would enable me to make an easy transition from clogged bottles of whiteout, a paper-littered floor, and my venerable typewriter to a screen with those jolly electrons just waiting to leap to the aid of a writer and his craft. That seemed simple to me.

I HAD A
20-page free-lance
project awaiting me,
and my desire to do it
on a word processor
was urgent.

My Kind of Teacher

I had a 20-page free-lance project awaiting me, and my desire to do it on a word processor was urgent. With the day now running away from me, I decided on one more store.

It was there that I found my mentor.

"I'm a writer, and I'm tired of whiteout," I blurted.

"You need a word processor," he said. "Here, I'll set one up for you."

He sat me down in front of an IBM PC, booted up word processing software, and won my affection instantly by telling me that he too hated whiteout. He also restored my confidence in my ability to learn when he said, "Booting is a term we use for turning on the machine and feeding the software into the machine."

"This is software," he said, holding a diskette for me to look at. "This one is MultiMate, one of many word processing systems you can use with the IBM. I'll bring it up and let you fool around with it. Call me when you need me."

Before he walked away, of course, he showed me some of the basic keys. Not once did he reach over my shoulder to push one. "Try that one," he said, pointing to the Insert key after I'd written some lines. "That's how you insert words after you've typed something."

I pushed the Insert key and typed in "Gosh!" He laughed, and so did I.

"If that's Insert, then I'll bet the key next to it is Delete," I said.

"You got it," he said and ambled away, leaving me alone to play around.

I had indeed got it. I'm familiar enough with computers and with myself to know that "If . . . then . . ." thinking is comfortable both for computers and for me.

As I played, I found new questions to ask, and my latter day Dewey came over at the slightest waggle of my finger. He'd answer one question at a time, briefly and to the point. He used no jargon.

I tapped the keys and almost finished three pages of a spontaneous article on picking up hitchhikers in Jamaica as the best way to learn about what's happening on the island. He came over, read it, and told me it sounded like a good place to visit. Then, he showed me how to reformat what I'd written and how to go directly to the print screen. He let me push the key that made the printer work, and in a minute, I had a copy.

I found errors that needed correcting. Instinctively I cringed.

"Find any errors?" he asked, steadfast at my elbow. "Well, it'll take a minute or two to correct them."

Following his coaching, I corrected them quickly and had a final copy ready to

go in another 3 or 4 minutes.

I was sold.

Two days later, I went to collect my IBM PC, along with a piece of software

I'M FAMILIAR
enough with computers
and with myself to
know that "If . . . then
. . ." thinking is
comfortable.

that coincidentally had a manual co-authored by another John Dewey. "To begin," the MultiMate manual says, "first-time users have built up a fear relating to word processing because it involves the use of a computer. They feel that if they press the wrong key, the computer will 'blow up,' or they will damage it. This is not so."

With that comforting invitation to mess around, I became an almost-expert word processor in less than a week. I made lots of mistakes and lost a couple of pages, and I suppose, in all honesty, I've still only tapped about half of what my word processor can do. But there is plenty of time to learn the remaining 50 percent, for I've already earned back the cost of my IBM, printer, software, and a couple of fancy peripherals.

There is still much I don't know about computers. But I am learning at my own pace, in my own ornery, and very, very efficient way. And, as I said, I don't think I am all that unusual.

I think John Dewey would have loved computers. I think, too, that he would have had something to say about learning to use them; that something might be like this:

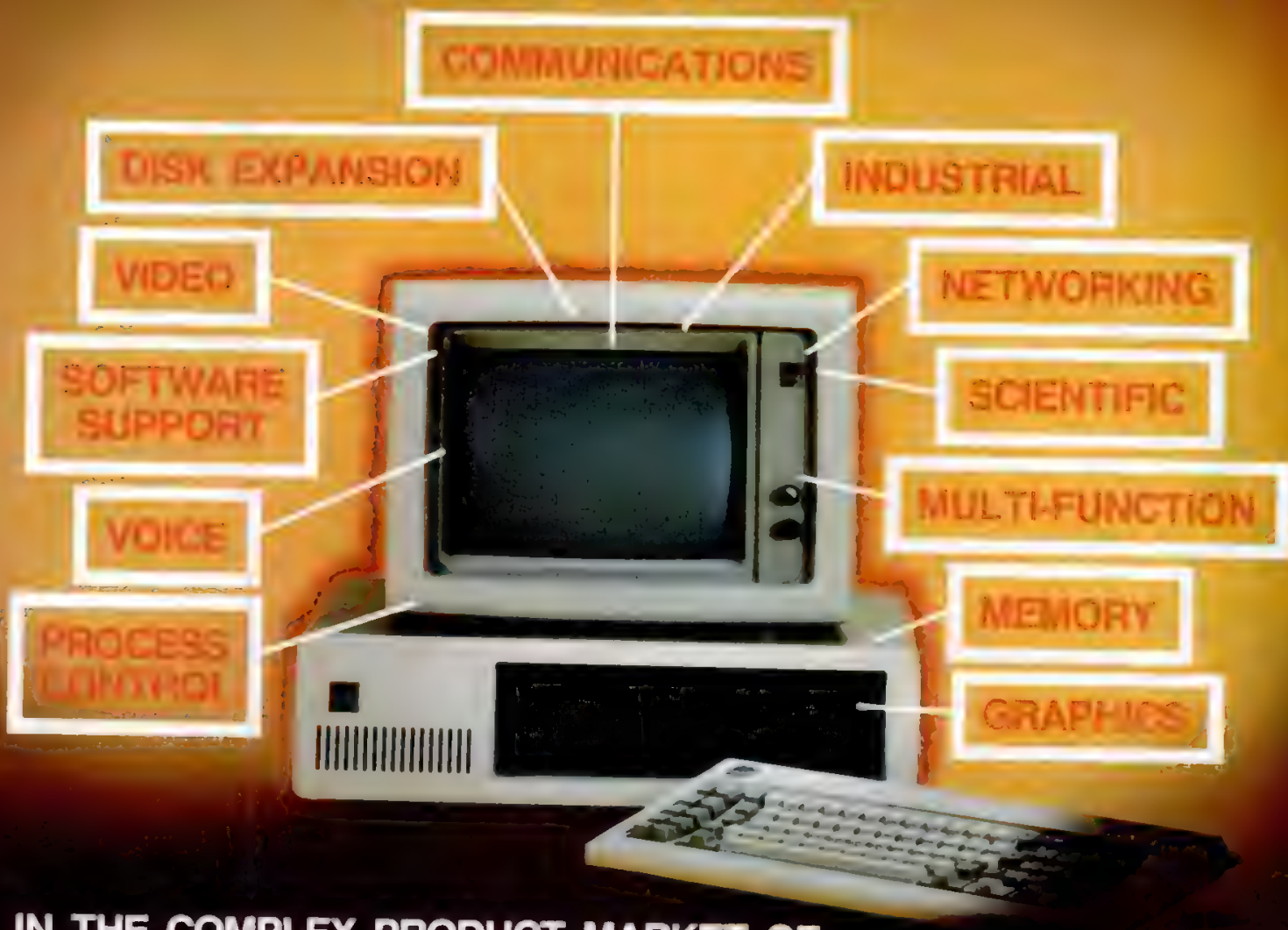
- Go to a computer store;
- find a congenial companion who knows more than you do;
- get your hands on a keyboard;
- flail around and make mistakes;
- ask questions;
- most of all, have fun.

Are you listening, computer people?

/PC

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THE **POWER**
BEHIND THE PC



IN THE COMPLEX PRODUCT MARKET OF
IBM PC ENHANCEMENTS, NO ONE OFFERS:

- More complete IBM PC expandability
- More solutions to today's business and technical computing problems
- More assurance of future compatibility with the next generation of technology
- More product reliability

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TECMAR THE ONLY NAME YOU'LL NEED TO KNOW

CIRCLE 494 ON READER SERVICE CARD

ComNet™ FROM TECMAR

NETWORKING

- Ethernet
- Electronic mail
- Device sharing
- No dedicated server required
- Operates with no floppy-based system
- Remote job execution
- File lock out
- Password protection
- Server back-up available

TELEPHONE SUPPORT

(available through modem board)

- Autodial - with extended telephone numbers
- Auto Redial
- Call Forwarding
- Length Of Call Indicator
- Directory Support - with unlimited number storage
- Message Support - either leave or obtain messages. Receive messages remotely
- This unit (with a handset) substitutes for a telephone

MODEM

- Gateway to networks
- Electronic mail
- Device sharing
- Remote job execution
- File lock out
- Password protection
- 300 to 1200 baud modems available
- Data in network can be obtained by decoding touch-tone sequence or through voice recognition prompt
- Respond to remote terminal
- Access dictating systems on network. Control them by touch-tone decoding
- Programs or calculator can be used remotely. The touch-tone keypad can be used to provide numeric input to programs or the calculator from a remote site (programs are loaded by decoding touch-tone sequences).

VOICE

- Voice mail
- Voice annotated text
- Voice messages

VOICE RECOGNITION

- Transparent keyboard. Speak instead of type
- Give commands over phone

SECRETARY \$1695¹

- Ethernet Link
- Ethernet Companion
- ComNet Software

EXECUTIVE \$2995¹

- Ethernet Link
- Ethernet Companion
- Modem (300 Baud)²
- Voice Recognition
- Microphone
- ComNet Software

ComNet

ComNet is designed to meet your total communication needs including computer to computer (networking), person-to-computer and person-to-person communication requirements for data and voice.

The network protocol employed is the industry standard high speed Ethernet which permits a number of IBM PC's to be linked together by ordinary thin coaxial cable. In addition to its own computer's power, a user has the availability of other devices which are also attached to the cable - such as various printers, plotters, large disks, etc.

All versions of ComNet include an Ethernet interface and conversion of voice into data and back again. This enables one to give and receive spoken messages from any location, as well as storing the message for later transcription. The SECRETARY is the basic system with these features.



¹With 1st MATE, 2nd MATE, or 3rd MATE in Station

²Option; 1200 Baud Modem

IMPROVE PRODUCTIVITY THROUGH TOTAL COMMUNICATIONS SUPPORT

DICTATING SYSTEM

- Control the Pearlcorder X-02 or XR dictating system at local or remote stations through keyboard or foot pedal control or by telephone touch-tone decoding. Allows you to dictate to the "ComNet" system from any place in the world.

FOOT PEDAL SUPPORT

- Controls dictating system
- Controls response to voice recognition

SOFTWARE

- Time Management - alerts you to appointments at any station you are logged onto.
- Message Management - either electronic mail or voice.
- Clock/Calendar - either visual or audible
- Calculator - either visual or audible
- Voice Management - oversees voice mail, voice message and voice annotated text operations

These software packages can be operated through voice recognition (even over telephone) with voice output, through the telephone keypad with voice output or through the IBM PC keyboard.

The MANAGER system adds a modem which can turn the PC into a telephone if a separate handset is added. The modem enables the MANAGER to receive unattended voice and data from any telephone in the world. The MANAGER can key in commands thru the decoding of the tones in the telephone keypad.

The EXECUTIVE is the most complete implementation of ComNet, adding computer recognition of spoken commands. An executive might phone the PC to leave or retrieve messages or request specific information. The PC, in a spoken voice, can request the user's access code (or respond to questions regarding which of several options is desired). The EXECUTIVE has the option of keying in answers or commands with the phone's tone dialing buttons, or simply speaking the answer or commands.



MANAGER \$1995¹

- Ethernet Link
- Ethernet Companion
- Modem (300 Baud)²
- ComNet Software

HARDWARE

ETHERNET LINK \$950

Permits communications between computers at extremely high speeds (10 Mbits per second). The transmission mode is through single video coaxial cable with easy-to-use BNC connectors.

ETHERNET COMPANION \$695

Performs the function of voice digitization and voice replay, dictation machine control and foot pedal control. Also contains interface for mouse.

MODEM

103 (300 Baud) \$295 212A (1200 Baud) \$695

- 103 (300 Baud) or 212A (300 or 1200 Baud)
- Pulse/tone automatic dialer
- Dual tone DTMF receiver (decodes touch tones)
- Auxiliary voice circuit
- Auxiliary, optically coupled, ring indicator output (capable of being used for auto power-on)
- Can replace telephone with the addition of a handset

VOICE RECOGNITION \$995 MICROPHONE \$170

User-dependent 100 word recognition (200 words optional) with 98% accuracy. Permits computer to respond to voice input.

**MORE TO COME...
ComNet FROM TECMAR**

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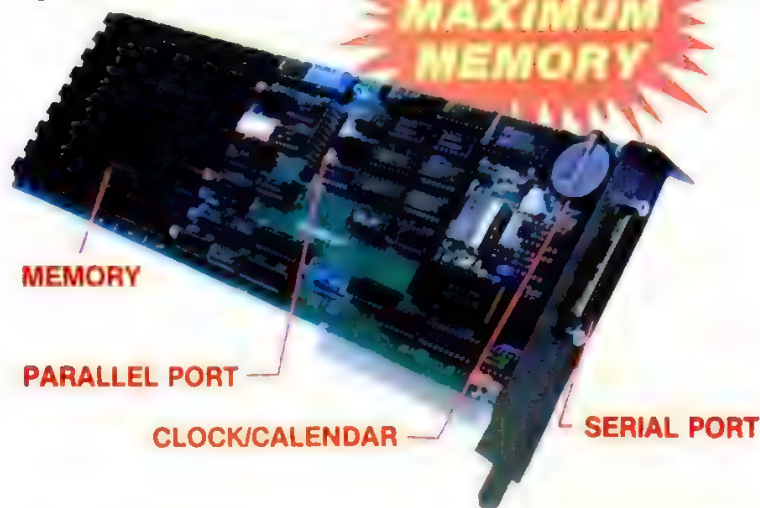
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CIRCLE 495 ON READER SERVICE CARD

FIRST FROM TECMAR

\$795⁰⁰

**NEW!
MAXIMUM
MEMORY**



CAPTAIN™

Provides the entire maximum 384K memory expansion for the PC XT or 384K extra RAM for the PC

TECMAR'S TOP OF THE LINE MULTI-FUNCTION BOARD

Performs eight (8) key functions in one (1) expansion slot with upgradeable (expandable) memory.

- **0 to 384K MEMORY** - fully socketed for easy field upgrade
- **CLOCK/CALENDAR** - with easily replaceable battery for back-up
- **SERIAL PORT** for communications — PC compatible (COM1, COM2)
- **PARALLEL PORT** for printer - PC compatible (LPT1, LPT2)
- **RAMSPOOLER** - easy to use - allows printing to become background task - choice of 8 memory sizes
- **SPEED DISK** - simulates ultra high speed disk
- **AUTO-TIME** - provides automatic insertion of date and time at power on
- Accepts exclusive **PAL Option** to restrict certain information on a "need to know" basis or to protect software
- Includes all connectors and cables
- Compatible with COMPAQ personal computer.



\$319⁰⁰

1st MATE™

\$319/Unpopulated Memory

\$389/64K \$469/128K

\$539/192K \$589/256K

Performs eight (8) key functions (same as the Captain).

Versatile - each 64K fully addressable.

These features are the same as described for the Captain.

- | | |
|-------------------------|---------------------|
| • MEMORY | • RAMSPOOLER |
| • CLOCK/CALENDAR | • SPEED DISK |
| • SERIAL PORT | • AUTO-TIME |
| • PARALLEL PORT | • PAL |



\$295⁰⁰

2nd MATE™

A wide range of I/O options - 4 ports with a clock/calendar when memory is not necessary.

- Two (2) **SERIAL PORTS** for communications, quality printers, modems — PC compatible (COM1, COM2 or other)
- Two (2) **PARALLEL PORTS** for printers — PC compatible (LPT1, LPT2 or other)
- **CLOCK/CALENDAR** with easily replaceable battery for back-up
- Accepts exclusive **PAL Option** to restrict information on a 'need to know' basis or to protect software
- Two (2) cables - one (1) serial, one (1) parallel - included
- Compatible with TI Professional (requires special software) and COMPAQ personal computers

PC MATES™ - A COMPLETE SERIES OF MULTI-FUNCTION MEMORY/COMMUNICATIONS BOARDS THAT GIVE YOU TOTAL VERSATILITY TO CONFIGURE YOUR SYSTEM.

3rd MATE™ ON-BOARD MODEM AND I/O OPTIONS

Pulse-dialing supported with no external cables or wiring. All you need is a phone jack.

- **MODEM** - 300 Baud, Bell 103, auto-dial, pulse-dialing supported, on board
- **SERIAL PORT** - for additional communications - PC compatible (COM1, COM2 or other)
- Two (2) **PARALLEL PORTS** for printers - PC compatible (LPT1, LPT2 or other)
- **CLOCK/CALENDAR** with easily replaceable battery for back-up
- Designed to accept exclusive **PAL** Option to restrict certain information on a "need to know" basis or to protect software
- Two (2) cables - one (1) serial, one (1) parallel - included
- Compatible with TI Professional and COMPAQ personal computers

NEW!



\$445⁰⁰

Scribe Tender™

Combines three (3) IBM options on one (1) multi-function board

- Two (2) asynchronous **SERIAL PORTS** identical to IBM ports, (COM1, COM2 or other) fully programmable
- Complete status reporting
- One (1) **PARALLEL PORT** emulates IBM printer adapter board, (LPT1) including software capability
- Compatible with TI Professional and COMPAQ personal computers



\$195⁰⁰

Triporter™

Designed to provide easy access to the connectors on multi-function boards, such as the Tecmar Scribe Tender, 1st MATE, 2nd MATE, 3rd MATE. Provides for mounting of up to four (4) male or female DB25 connectors on back of IBM PC or Tecmar Expansion Chassis slot. (Cables \$25 extra)

- Easy to install
- Accommodates 26 conductor cables
- Mounts in expansion slot opening
- Housed in steel case



\$95⁰⁰

THE TECMAR PRODUCT LINE ADVANTAGES

- All Tecmar products carry a full one (1) year warranty
- Guaranteed 72 hour repair service (24 hour average)
- Total compatibility with IBM PC and all Tecmar products
- Proven reliability
- Strong manufacturer's support with immediate access to Customer Service
- Largest selection of IBM PC compatible products in the world

Most products compatible with Compaq, Columbia and TI PCs

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TECMAR
\$1795.00

complete with
 controller & cartridge

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CIRCLE 497 ON READER SERVICE CARD

This is the breakthrough in storage that IBM PC people have been waiting for, as Tecmar engineering keeps you moving ahead.

- the new SyQuest 5 Megabyte removable cartridge Winchester disk drive
- complete, easily installed in IBM PC or available in IBM-compatible Tecmar expansion chassis
- new Tecmar superspeed controller
- Tecmar disk sharing for up to 4 IBM PCs
- your best solution for mass storage, and the most sensible back-up system available.

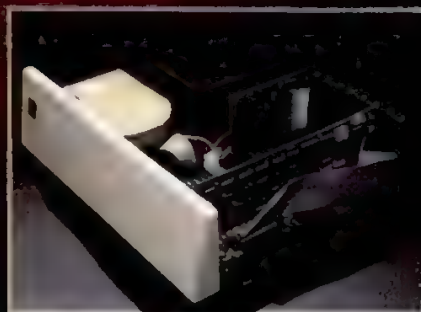
We believe this is the future in storage because we have proved its reliability and its advantages. The new removable cartridge gives you unlimited memory at a lower price tag than the basic Winchester at comparable speed.

\$1795 complete with
 controller & cartridge
 AVAILABLE NOW AT YOUR TECMAR DEALER



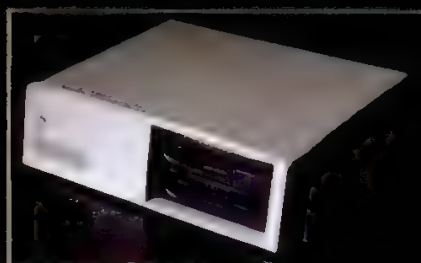
**TECMAR COMPATIBILITY, VERSATILITY,
 RELIABILITY, AFFORDABILITY,
 RESPONDABILITY**

The first and only complete line of fully compatible expansion options for IBM PCs, including every type of disk drive



NEW SHARED WINCHESTER PC-MATE™

Our new GT subsystem upgrades our original with 3 times faster speed, sharing for up to 4 IBM PCs . . . Controller Board available for upgrade on trade-in.



PC-MATE™ FLOPPY

Controller Board will handle 5 1/4" and 8" disks. Winchester can be installed in our floppy subsystem cabinet.

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\$1595.00

**PC-MATE BAK-PAK
WINCHESTER BACK-UP 6.25
MEGABYTE DISK PACK
\$1595.00**

The "Bak-Pak" System comes in an IBM-Compatible/PC-MATE Mini-cabinet complete with software, power supply, controller and cables. Features removeable media in packs with 6.25 megabytes of formatted storage per pack. Additional packs available at \$95.00.

The controller substitutes for the IBM floppy disk controller, so no additional slots are necessary. Also can be used as primary high capacity storage system.

TECMAR
\$3995.00

**HIGH CAPACITY STORAGE
26 MEGABYTE WINCHESTER
\$3995.00**

Comes in IBM Compatible/PC-MATE Mini-cabinet complete with software, power supply, controller and cables.

- Compatible with all Tecmar disk expansion systems
- Allows disk sharing for up to four (4) IBM PCs

26 Megabyte Winchester is also available in IBM-Compatible PC-MATE Expansion Chassis which offers an additional five (5) expansion slots and independent power supply for \$4295.00.

Other Winchesters From Tecmar:

- 10 Megabyte in Mini-cabinet - \$2495.00
- 15 Megabyte in Mini-cabinet - \$2895.00
- 10 Megabyte in PC-MATE Expansion Chassis - \$2795.00
- 15 Megabyte in PC-MATE Expansion Chassis - \$3195.00

Other configurations of fixed Winchester, removeable cartridge Winchester and 8" floppy disks are also available from Tecmar. Contact your local dealer or check Tecmar's full-line catalog for details.

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SYSTEMS
SOLUTIONS**

**HIGH
CAPACITY
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SOLUTIONS**

Call or write for the latest catalog of PC-MATE peripherals from TECMAR. Updated continuously as new products come on-line.



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New! Tecmar Tape Back-Up
Coming Soon

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CONFIDENCE IS NO EXTRA CHARGE.

COMPATIBLE

All TECMAR products are designed to be fully compatible with each other and the IBM PC for smooth, trouble-free performance in your system.

SUPPORTABLE

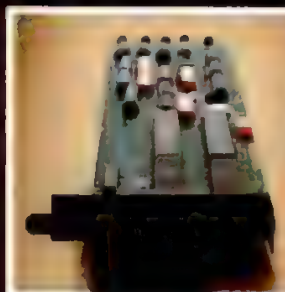
Our philosophy of total support adds uncommon value to your TECMAR products. All TECMAR boards feature a one-year warranty, with guaranteed 72-hour maximum repair turnaround on all standard products. Replacement loaner units are available. Thorough and straightforward documentation comes with each unit. Our customer service staff is available to answer questions or solve your problems.

EXPANDABLE

Our products allow easy expandability, so your system capabilities can grow with your needs.

There's more! TECMAR's broad line of compatible IBM PC Industrial/Scientific products includes:

- High Resolution Graphics
- 5 $\frac{1}{4}$ " and 8" Floppy Disc Controller
- Video Digitizer
- Video Cassette Recorder Controller
- Speech Synthesizer
- Voice Recognition
- D/A Converter
- Stepper Motor Controller
- EPROM or EEPROM Programmer/Reader
- Static RAM/ROM
- CMOS Memory



**IEEE488 INTERFACE
plus SOFTWARE**

\$395

\$95

It implements IEEE488 industry standard to allow IBM PC to operate as system controller or as an addressed talker/listener. Has DMA and interrupt capabilities. Available library of assembly language subroutines called from BASIC or FORTRAN for data transactions with other devices. Order #20030 INTERFACE, #30030 SOFTWARE.



LAB MASTER™

\$995

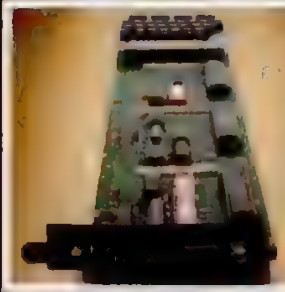
A sophisticated system that includes 16 channels of 12-bit A/D with a 30KHz conversion rate, two channels of 12-bit D/A, five timer/counters, and three 8-bit parallel ports. Options include programmable gain up to 1000, 14-bit 16-bit accuracy, 40 and 100 KHz conversion rates up to 256 channels. Order #20009.



LAB TENDER™

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An economical and versatile system designed for data acquisition and control applications. Includes 16 channels of 8-bit A/D conversion, 16 channels of 8-bit D/A conversion, five timers, and three 8-bit parallel ports. Order #20028.



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Digital Input/Digital Output board with four sections of 24 DI/DO lines. Each section can be used as a stand-alone DI/DO interface or with a daughter board for prototyping or custom functions such as opto-isolated input or opto-isolated output. Order #20025.

We are proud to offer the largest line of options available anywhere for the IBM Personal Computer. All Tecmar products are designed with advanced technology as it becomes available. We add new products monthly like the PC-MATE removable Cartridge Winchester drive. TECMAR offers complete reliability and backs it up with support.

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SOLUTION-ORIENTED DESIGN WITH THE USER IN MIND A FULL LINE OF PROBLEM SOLVERS



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DIGITAL INPUT/OUTPUT
(DADIO)** \$395

100-pin D-sub connector for IBM PC/XT/AT
100-pin D-sub connector for IBM PC/XT/AT
100-pin D-sub connector for IBM PC/XT/AT
100-pin D-sub connector for IBM PC/XT/AT



SPEECH MASTER \$395

Any application where verbal
communication is required.
Uses the VOTRAX phoneme-level
synthesizer for natural
vocabulary, and the NATIONAL
Semiconductor-level synthesizer for
unlimited vocabulary. Features an on-
board speaker or amplifier.



**VIDEO VAN GOGH
plus SOFTWARE** \$345
\$95

100-pin D-sub connector for IBM PC/XT/AT
100-pin D-sub connector for IBM PC/XT/AT
100-pin D-sub connector for IBM PC/XT/AT
100-pin D-sub connector for IBM PC/XT/AT



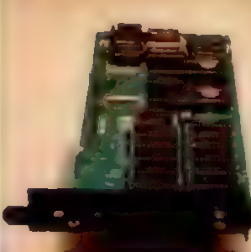
**DEVICE MASTER
plus SOFTWARE** \$245
\$35

Can be used for energy management,
security, or just for convenience. This
device uses the IBM X-10 bit turns
electrical outlets on or off and dims
lights without additional wiring. It uses
no direct AC connection, avoiding
damage to the computer. Contains a
rechargeable battery and battery.



**VIDEO CASSETTE RECORDER
CONTROLLER** \$495

100-pin D-sub connector for IBM PC/XT/AT
100-pin D-sub connector for IBM PC/XT/AT
100-pin D-sub connector for IBM PC/XT/AT
100-pin D-sub connector for IBM PC/XT/AT



PEPPER MOTOR \$495

100-pin D-sub connector for IBM PC/XT/AT
100-pin D-sub connector for IBM PC/XT/AT
100-pin D-sub connector for IBM PC/XT/AT
100-pin D-sub connector for IBM PC/XT/AT



**EEPROM PROGRAMMER/
READER** \$495
EEPROM EXPANSION \$595
EEPROM SOFTWARE \$95

100-pin D-sub connector for IBM PC/XT/AT
100-pin D-sub connector for IBM PC/XT/AT
100-pin D-sub connector for IBM PC/XT/AT
100-pin D-sub connector for IBM PC/XT/AT



TIME MASTER \$135

100-pin D-sub connector for IBM PC/XT/AT
100-pin D-sub connector for IBM PC/XT/AT
100-pin D-sub connector for IBM PC/XT/AT
100-pin D-sub connector for IBM PC/XT/AT

TECMAR - THE ONLY NAME YOU NEED TO KNOW
CIRCLE 500 ON READER SERVICE CARD

THE ULTIMATE SOLUTION TO THE PC EXPANSION DILEMMA.

Every owner of an IBM PC, PC II, PC XT or PC compatible computer has a terrific personal computer, and one great big problem. With all the different peripheral applications and functions available today, how do you take maximum advantage of your computer when your computer gives you so few expansion slots to take advantage of?

Until now there has been one basic solution with a multitude of ingenious, yet ultimately unsatisfactory, variations. You could, in effect, increase your expansion capability by buying a single circuit board configured with a super, maxi, ultra, mega collection of functions and applications built right into it.



The only difficulty with that approach, though, is that you end up getting the solution to somebody else's problem. What happens when you want a different set of peripherals than is commonly asked for? Either you don't get what you want, or you end up getting—and paying handsomely for—a bunch of unwanted circuits. And then what happens if you decide to add a function later on? or your computing tasks change? or a new peripheral becomes available? Every option you have will cost you a bundle.

THE BUSBOARD SOLUTION

Now from LNW Computers comes the perfect solution—a circuit board so versatile that it comes with 64K of built-in RAM (expandable to 512K) and the ability to accept up to eight different peripheral modules in easy plug-in design. We call it the Busboard™, and you'll call it the answer to every expansion dream you've ever had.

With the Busboard™ you'll be able to design an expansion board with the specific solutions to your specific problems. You can add a single coprocessor and 6 I/O devices, or up to 8 separate I/O devices on a single board. You won't have to pay for functions you don't want, and you can buy additional modules as you need them or can afford them. You can take modules off or add them on, and you'll never have to worry about obsolete boards when new functions become available. Your Busboard™ will always be able to accept the latest innovations in new product design.

And, because the Busboard™ is modular in design and construction, it costs a lot less than you might otherwise expect. You'll be amazed when you figure out the cost of a Busboard system custom-designed for your needs versus a preconfigured card designed for somebody else's needs.

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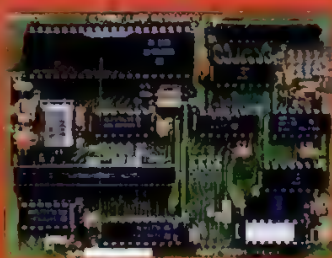


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Allows for addition of I/O devices and additional processing power through coprocessor BUS. Can be used for slave, multi- or compatible processing. Busboard comes complete with 64K of parity checking RAM and is fully expandable to 512K RAM in 64K plug-in increments. Maximum expansion to 704K allows for emulation of entire dual-sided disk drive, spooling of lengthy documents to RAM and full use of CP/M PLUS™ adapter card. Busboard™ also comes with BUSDRIVE™, a high performance disk drive emulator, and SPOOLBUS™, a multi-printer, auto-manual queuing printer spooler. Both diskettes are MSDOS™ (PCDOS™) and CP/M-86™ compatible. **Suggested retail \$349.95.** RAM-less. **Busboard™** is a modular circuit board coprocessor slot and RAM. Can be exclusively for I/O module expansion. **Suggested retail \$129.95.**

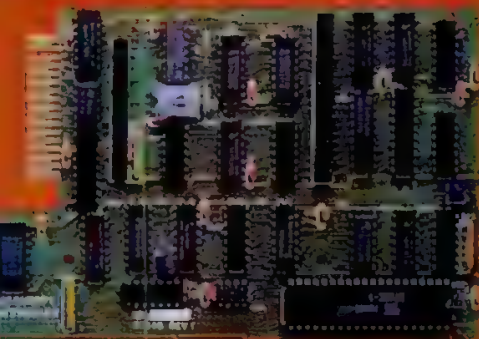


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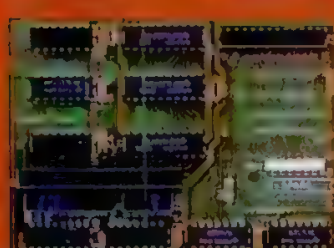
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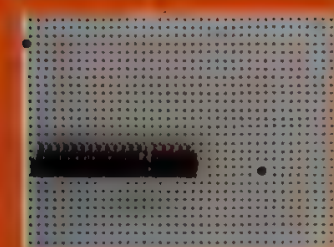
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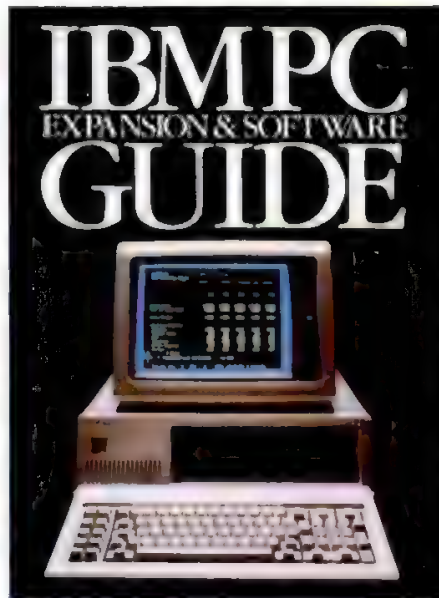
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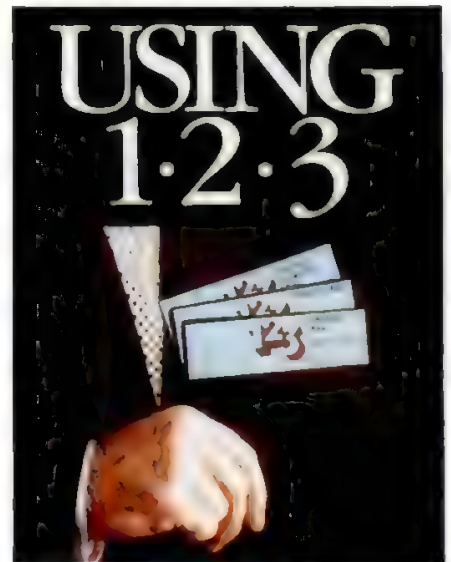
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Initial encounters with personal computers, it seems, have spawned more horror stories than Alfred Hitchcock, toxic waste, and mothers-in-law combined. Little wonder then, that the neophyte ap-

THE BASIC-Power lesson plan is designed for complete consumption in one sitting.

proaches a Personal Computer about as calmly as he would approach a rabid animal.

On your own, there is no easy way to establish a friendly relationship with the IBM PC. Trial-and-error training can take weeks, months, years—even centuries.

This is clearly too long when your department manager expects you to be producing valuable reports on your new machine before the IRS arrives for the audit tomorrow morning.

One alternative is the traditional one: Pick up a book or two during your lunch-break. Dozens of texts are waiting to introduce you to your new computer, the BASIC language, VisiCalc, and its spreadsheet brethren. But books by and of themselves are not the answer.

Even if you do happen upon a book that's both lucidly written and that makes sense to you (there are several good texts available, it should be noted), you still face a major hurdle, namely, your first few keystrokes on the machine itself. Proficient typists have been known to develop a form of digital paralysis upon their first encounter with a computer keyboard. It's almost as if somewhere in the collective subconscious there's a primitive suspicion that pressing the wrong key will cause your new \$5,000 investment to irretrievably collapse before your eyes. Fur-

thermore, using a book to learn about your computer seems retrograde, and for this purpose at least, anachronistic.

Happily, there is an alternative. You

USE YOUR computer to teach yourself about computers.

can use your computer to teach yourself about computers. A growing collection of training software for the IBM PC is designed for exactly that purpose. Programs to introduce you to your new machine, programs to help you get your fingers on BASIC, VisiCalc and other application programs, and even programs to improve your programming skills can now be found lining the shelves of many

computer stores.

If you've just bought an IBM PC, if you're just thinking about it, or if you have a machine that's gathering dust because it's unable to read your mind and do what you want it to, one of these programs may be able to help you put your investment to better use.

Evaluated here are five selections that can help get you started. The Cdex Training Program for the IBM Personal Computer is aimed at the first-time computer user; Cdex Training for VisiCalc and American Training Institute's (ATI) Basic-Power (for BASIC), and Plan-Power (for VisiCalc) training disks and handbooks assist the business-computing beginner who wants an introduction to what these application programs can do on his PC; and the Alpha Executive Package can help hone your skills in applying both VisiCalc and BASIC to real-world business problems.

Cdex IBM PC Training

If the closest you've ever come to a computer is getting a computerized utility

bill, Cdex Training for the IBM PC is aimed at you. The underlying assumption of this software package is that you bought a PC and managed to figure out how the on/off switch works, and nothing more.

The program begins by drawing a picture of a disk and a disk drive. It then tells you the proper way to put a disk into the drive. However, the program does not reveal by what mysterious process it assumes you got your first Cdex disk into the drive so that you could learn how to put a disk in the drive in the first place. (Maybe Cdex hopes that IBM will deliver PCs with their initial training disk already in the A drive.)

Ignoring this trivial inconsistency, the apprehensive computing beginner should find a friend in Cdex. The IBM PC training program begins with a menu of subject areas that it will teach. There are ten choices: how to use the training program itself; a system overview ("this is a diskette"); first contact (how to "boot" DOS); system components ("this is a keyboard, this is a monitor"); DOS; using BASIC ("first load BASIC, then run a program"); system details; advanced DOS; other operating systems and languages; and application programs.

The lessons highlight the fundamentals of the areas they claim to cover. They tell you what to do without giving an in-depth explanation or any background on why you must do things precisely the way you are told to. As my comments above may indicate, a Cdex lesson approximates

You
managed to figure out
how the on/off switch
works and nothing
more.

the Monty Python explanation of the proper method of playing the flute: "To play the flute, blow in one end and move your fingers up and down." If you are expecting to become proficient on your PC, do not be misled into thinking that a quick run-through of this program will accomplish that. But it can teach you how to perform elementary functions and give

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you an overview of the capabilities of the IBM PC. Moreover, if your fingers tremble over the keyboard because you're afraid a mistake will make the whole machine disappear in a cloud of smoke, the Cdex walk-through of the wonderland of computing will put your mind at ease.

The key asset of this program, or any introductory software, is its simplicity. Just slide the first of the three disks Cdex supplies (appropriately numbered) into your PC, turn the machine on, and it runs itself. (Unless you have an XT. Written in p-System, the program not only refused to run on the XT when I tried it, but left the floppy disk drive spinning madly away, potentially forever.)

Besides helpful text, illustrations are drawn on the monitor screen, either to show mechanical relationships (drawings of disks and drives) or conceptual relationships (such as a Venn diagram showing disk BASIC to be a subset of Advanced BASIC).

To allay your fear of the keyboard, the program initially asks you to type in your name. When running, it simulates the PC-DOS operating system and BASIC, and asks you to type in commands. If the commands you type in are exactly correct, it congratulates you and gives a simulation of the function being executed. If you make a mistake, it tries to take the sting out of an incorrect response with levity: "Oops . . . your fingers are having trouble finding the keys," it says at one point. The program automatically inserts the name you initially typed in to personalize the comments it makes to you ("Good job, Rat-fink," it told me once. Of course, that was the name I gave it.)

Alas, although the program does tell you your entry is incorrect, it doesn't tell you what you did wrong. Your only resource is to try again; the program assumes that you'll see the disparity between what it asked for and what you gave it.

Along with the three lesson disks, the program set includes a handsome reference manual in a vinyl-covered loose-leaf binder. The printed materials explain how to get the lessons up and running, give a keyboard reference (telling which keys do what), provide a DOS Command Reference to supplement and simplify the IBM-supplied materials, and present a list of exercises to reinforce what you have learned.

When it's time to change disks, the program prompts you. I had no problem with this—except that disk number three absolutely refused to run. Consequently, I may never know about other operating systems, applications programs, or whether the lessons have a happy ending.

Should you be able to finish all the lessons, you'll know how to handle rudimentary DOS functions like formatting and copying disks; renaming, comparing, and erasing files; and booting up. Although you will not learn the intricacies of assembly-language programming or how to make Beef Wellington, you will know how the individual parts of the IBM PC work together as a system.

Cdex on VisiCalc

A knowledge of PC-DOS will help you run your computer, but without an application program or knowledge of a programming language, you're not likely to be able to do much of anything useful.

Personal computers initially proved their worth in business by running elec-

tronic spreadsheet programs that helped executives make projections and answer "what if" questions. Unfortunately, most businessmen are as unfamiliar with electronic spreadsheets as they are with personal computers themselves. The organization, capabilities, and even the language of spreadsheets are something many have never encountered before.

THE PROGRAM assumes that you'll see the disparity between what it asked for and what you gave it.

Cdex Training for VisiCalc is an attempt to help familiarize the computer-naive businessman with the workings of the archetypal spreadsheet program. In

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style and approach it strongly resembles its sibling lessons for the IBM PC. It begins with instructions on how to boot the system and load the spreadsheet program, then ventures on to a menu of the functions you can do and learn. You are given a dozen choices: how to use the program, key terms, how to move the cursor, how to label columns and rows, how to enter values and formulas, working with functions, using commands, saving and retrieving your work, printing, the concept of replicating your work, the process of replicating your work, and a quick reference menu.

The training is handled better than in the initial Cdex IBM PC lessons, and you get more of an explanation of why things must be done in a particular way. The program emulates the VisiCalc worksheet. This means you'll see on your monitor what the worksheet looks like, and you will enter data into it just as you would with VisiCalc, but the only commands and functions that you can use are those that Cdex tells you to use. When it's time

for a computation, the numbers change right before your eyes. "That's why it's called VisiCalc," Cdex tells you.

Not everything is displayed on the screen, however. Often you are referred back to the manual for an elaboration on specific commands and for exercises that help develop your VisiCalc skills. One section of the manual shows sample worksheets that correspond to on-screen lessons. It lists the keystroke sequences necessary to create them to go along with the on-screen lessons. Precisely duplicating the listings on your copy of the real VisiCalc program takes a sharp eye and close attention to detail; in other words, it can be tedious!

After the Cdex training program teaches you a new function or command in VisiCalc, you are given an opportunity to put your newfound knowledge to use. The quiz is optional, however; a menu of alternatives at the bottom of the screen includes the selection, "Skip," which allows you to bypass the problem and to advance to the next section. Other menu

selections include "Hint," which points you to the proper solution; "Review" which sends you back over familiar territory for a second try; "Menu," which offers you a choice of other lessons or the reference menu to refresh your memory; and "Exit," which lets you give up and go get a beer.

When you finish with the training program, you have gained an overview of how VisiCalc works and an understanding of its usefulness, but then you're on your own; putting it to work is up to you. You will have to develop spreadsheet models for your personal business functions. Although you won't be a VisiCalc expert—that will probably take working with the spreadsheet program itself for several months—you will no longer be in awe of your co-workers who are experts.

ATI: Another Approach

At first look, "ATI Training's Basic-Power is unimpressive. Open the red, white, and blue box, and it's even less impressive, a genuine cardboard loose-leaf binder and a single disk. After its initial bad impression, ATI's Basic-Power: MBASIC Interactive Training Disk and Handbook had to be some program to earn respect from me. Its on-screen approach to training (however imperfect) does, in fact, deserve a salute.

I offer a salute because not only does ATI tell you what to do to operate BASIC, it also tells you why you must do it. Rather than just praising you every time you press the right buttons, it gives you background into the structure and workings of BASIC. For instance, Basic-Power will show you a program listing, then break it down to show how each statement works in data input, output, or processing. In other words, ATI assumes that you are

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The Basic-Power format is rather straightforward. You are shown a program line, told what it does, and commanded to

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duplicate the line by typing it on your IBM PC keyboard. *Basic-Power* is as unforgiving of errors as is real BASIC. You must fix all your errors before the program allows you to venture on to its next tidbit. If you strike the wrong key, the program slows data entry as it insists that you go back and correct the error. The lesson is harsh, but it does enforce accuracy.

Unlike *Cdex*, the *Basic-Power* tutorial is single-minded and unrelenting. You must march through the exact sequence of screens that has been deemed the proper order for learning things by the program's creator; skipping ahead or lagging behind is not permitted. The rigid structure can be frustrating. As the program begins, your choices are limited to the introduction to BASIC, reviewing a specific area, or stop-

***T**HE SKIMPY training manual is little more than a rehashed listing of BASIC commands.*

ping (which takes you directly to the operating system). According to the lesson plan you must begin with the introduction to BASIC whenever you use the program. Every time you make that menu selection, you must start from the beginning. Regardless of how far you got through the tutorial the last time you tried it, you must go through each and every step to get to where you were before. Obviously the *Basic-Power* lesson plan is designed for complete consumption in one sitting. Fortunately, you can go through it in a few hours.

Should you choose to "review" from the initial menu, however, you'll soon discover how to beat the rigidly structured system. "Review" dumps you into the ongoing lesson at a preset point, depending on your choice of what you want to review. If you want to dash ahead, simply choose to "review" something you haven't done before.

The skimpy training manual provided with the program is little more than a rehashed listing of BASIC commands. Its few pages are perhaps more understand-

able than the IBM BASIC reference manual, but they hardly make exciting reading. The booklet is not nearly as complete as the IBM manual.

When you finish the entire tutorial, you will not be a proficient BASIC programmer. Reaching that target takes insight that can only be gained from experience. But after you finish *BASIC-Power*, you will know how BASIC commands are put together, and you'll have an appreciation of the programmer's work. *Basic-Power* lays a foundation on which you can build your knowledge of programming. And, like the *Cdex* program, it should dispel those initial fears of using your computer for the first time.

Plan Power for VisiCalc

The approach taken by American Training International in *Plan-Power: Interactive Training Disk and Handbook for VisiCalc* is very similar to *Basic-Power*. So, sorry to report, is the packaging.

In some ways, *Plan-Power* seems more understanding and understandable. When

I made an error in an entry (intentional, of course), rather than just telling me that I had done something wrong and to do it over, the program told me what to do right.

***P**LAN-POWER has the same rigid, unrelenting structure as Basic-Power.*

In other ways I was disappointed. Instead of discussing the complete array of command options available in *VisiCalc* and their ramifications, *Plan-Power* referred me back to *VisiCorp's VisiCalc* handbook. If I had wanted to wade through the materials in there, I might just as well go through the *VisiCalc* tutorial.

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the Cdex VisiCalc training package, nor does the material on its single disk offer as much insight into the operation of the spreadsheet as *Basic-Power* does on BASIC.

Plan-Power has the same rigid, unrelenting structure as *Basic-Power*, however. If you interrupt the program for any reason, the only way to get back to where you were is by marching through all the previous lessons—unless you cheat by “reviewing” the lessons you haven’t yet reached.

Plan-Power will not teach you everything there is to know about *VisiCalc*, nor will it give you much of a view of the power of a spreadsheet program or how using one can help you in your work. It will, however, help you become familiar with a few elementary commands and functions of *VisiCalc* and turn your PC into an educational tool.

The Alpha Executive Package

Rather than trying to overcome that perceived fear of the computer (all begin-

ners are assumed to have) with an interactive computer program, Alpha Software provides an audio tape cassette. Drop the tape into your cassette recorder, and a mellifluous voice reassures you that computers are our friends and that you’ve done the right thing by buying the Alpha Executive Package. When slow-talking Mr. Mellow tells you to press a key on your computer, you hear the sound of him doing likewise. It’s enough to rot your teeth. You almost expect a hand to come reaching out of the cassette recorder, to pat you on the head and reassure you that everything will be all right.

While the tape might give you the impression that these folks think you’re 10 years old, the rest of the program takes the opposite tack. The Executive Package can refine and hone your skills in using both BASIC and *VisiCalc* in business management.

Unlike the Cdex and ATI software, the Executive Package is not interactive: Your computer does not lead you by the hand. In fact, you can work your way through

the Alpha Executive Package without a computer at all. The manual contains all of the lessons. The two computer disks provided serve as an electronic workbook

YOU CAN
*work your way through
the Alpha Executive
Package without a
computer at all.*

to supplement the manual and as a future (and potentially quite useful) prefabricated utility-program library.

The Executive Package presentation format uses the straightforward case-study approach favored by the Harvard School of Business. First you read a scenario of the business situation, a problem that can only be solved by immediate computer intervention. With some hints from a wizened old expert who’s been solving problems on his computer since before the electric light was invented, the solution and its translation into BASIC becomes obvious even to the dimmest among us. As the problem is solved, a program is written out, and to save time it’s provided both in BASIC and, optionally, as a *VisiCalc* template on the accompanying reference disks. Although the dialogue in the scenarios is hardly National Book Award quality, the roughly two dozen situations presented are relevant to regular business practices, and the utility programs provided can be easily structured for your specific needs: adjusting prices to inflation, scheduling employees, project planning, inventory checks, and so on.

The underlying philosophy of the case-study approach is that you don’t just learn how to write a specific program. Instead, you learn how to analyze a situation, determine a path to the solution of the problem, and implement that solution using BASIC. When a similar situation occurs in real life, you’ll be able to analyze it, perhaps find a similarity to one of the problems you had worked on in your Executive Package training, and apply that lesson to the real problem.

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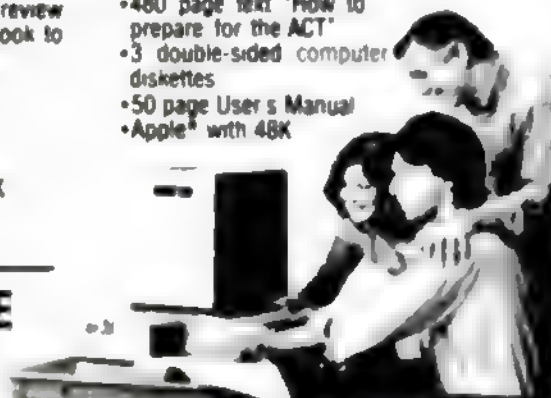
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complex in the journey through the Executive Package, more sophisticated programming techniques are introduced. Although you may have felt like a moron while listening to the cassette tape, by the time you've finished the last lesson, you'll feel like a programming expert—and you just may be able to write circles—or loops—around the hackers in your office who pride themselves on never opening a book or reading a training manual.

Solutions to the same problems that are covered in the context of BASIC are presented using the VisiCalc spreadsheet program. Rather than emulating an electronic spreadsheet, the approach favored by Cdex and ATI, Alpha provides files of data and templates to add to your own working program. Alpha relies on your learning the basics of the spreadsheets through the use of the tutorials provided with the VisiCalc software itself. You should be reasonably familiar with the spreadsheet before you try the Executive Package, perhaps by first studying the proper Cdex or ATI training programs.

THE VISICALC supplement is included before the BASIC example situations it refers to.

The Executive Package comes in a cloth-bound loose-leaf binder the same size and format as standard IBM-issue manuals. Its organization is a bit confused—the VisiCalc supplement is included before the BASIC example situations it refers to—but such problems can be solved by opening the binder rings and rearranging pages.

Compatibility Problems

After running through all five of the above programs on a current model IBM PC, I joined forces with Steve Little of ComputerLand in downtown Cleveland and tried the software on various IBM and IBM-clone computers. I wanted to see what you might expect should you be favored with a slight variation on the PC

theme. We tried the following machines: current IBM PC, IBM Personal Computer XT, Compaq, and Texas Instruments Professional running MS-DOS. The results were very much as we had expected. All programs happily churned away on the standard PC and on the Compaq. The two Cdex programs, written in the UCSD p-

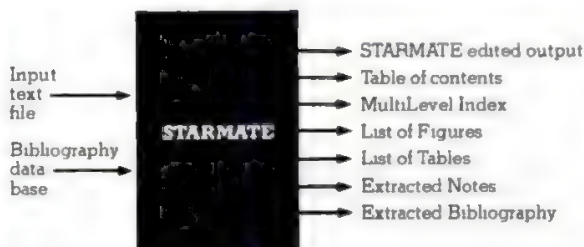
System, gave both the Texas Instruments Professional and IBM Personal Computer XT severe indigestion; the ATI software ran successfully on everything but the Professional. The BASIC files provided with the Alpha software executed on BASIC loaded into any of the machines.

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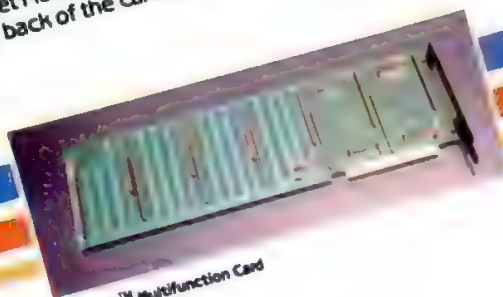
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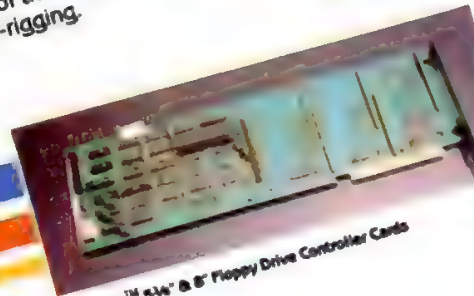
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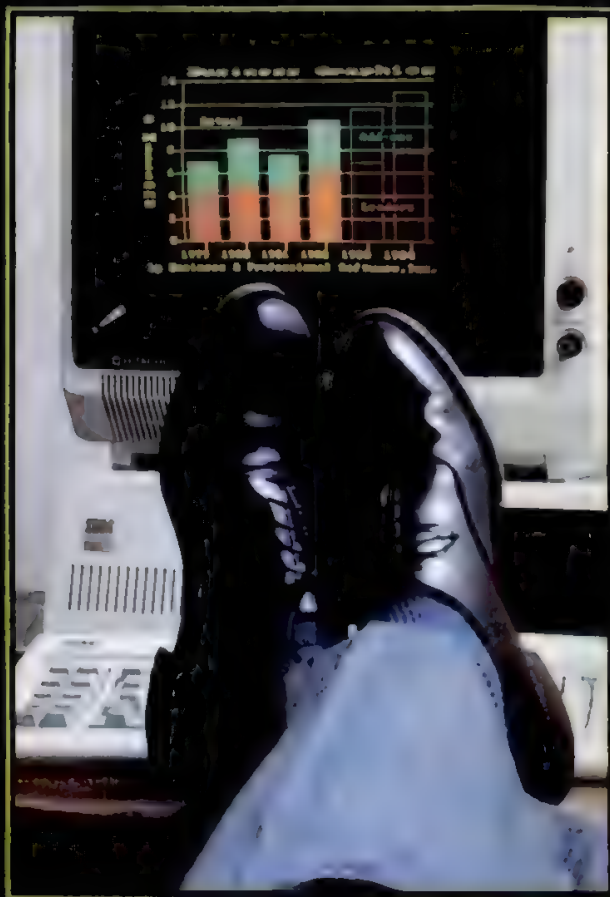
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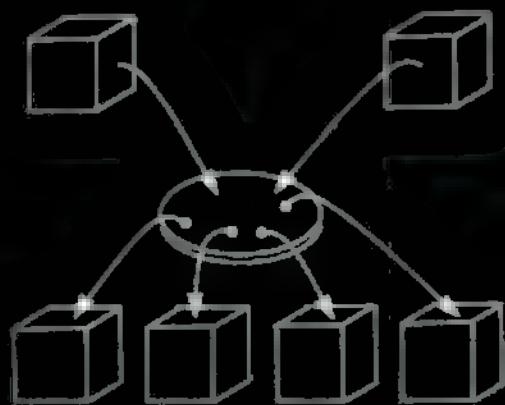
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Programs are modular, menu driven, written in BASICA, fully explained and keyed to theory. They are listed in the book alongside theory and equations. Use as-is or modify to best suit your own applications.

Four data base management programs are included. These create x, x-y, x-y-z and stock market data files and store them on disk. Plotting programs read the data files and carry out sorting, statistical analyses and plot results.

Features include automatic scaling, axis marking and numbering, auto replot when data changes, and a special program called LABELER which places text and symbols over graphics using a moving cursor.

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After being stored on disk, the drawings may be recalled by applications programs which perform mechanisms simulation, heat transfer, matrix operations and optimization using Monte Carlo techniques. Programs are also included for Fourier Series and Transforms. These graphically display spectra alongside waveforms.

All programs are menu driven, written in BASICA and fully documented and keyed to theory and equations.

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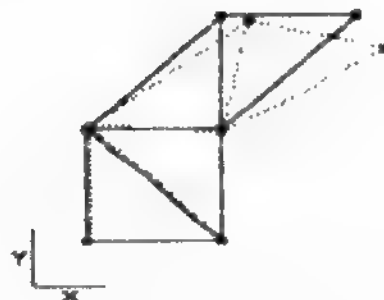
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Applications to science, education and business included. Also covers hardware needed for PC graphics, use of the PC's special graphics enhancements, and how to separate text from graphic on the PC's screen.

Contains 61 programs arranged in a tutorial manner leading from one step to the next. Math level is kept to a minimum and new concept are explained as they are used.

Much of this softkit is based on the popular *Graphic Software for Microcomputers* by B.J. Korites which was named "The Best Book on Microcomputer Graphics" by *Creative Computing* magazine.

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This system of programs is patterned after large-computer structural analysis systems such as ADINA and NASTRAN, but reduced in scale for micros. They were written by B. J. Korites, PhD, former CAD/CAM consultant to the Arthur D. Little Company.

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"Welcome . . ." a suave, assured male voice calls out as a camera pans in on an IBM PC. "You now have one of the most powerful tools modern technology can provide. . . ." I am seated in front of a video cassette recorder, watching the introduction to *How to Use Your IBM PC in 10 Easy Lessons*, a new tape produced by Kennen Publishing of Mill Valley, California. Next to the VCR is an IBM PC on which I will try some of the more than 80 "hands on" exercises on the tape. The tape has been known to take first time users from complete ignorance to literacy in a single day, according to Marijane

Lynch, cofounder of Kennen Publishing.

Lynch and her partner, Ed Dudkowski, believe in the "quick, total-immersion" philosophy of learning. Soon after switching on the first lesson, I'm listening to a complex discussion of the differences between ROM and RAM. In over my head already, I stop and replay the section twice. Eventually the concepts sink in. One of the beauties of learning from a cassette, Dudkowski points out, is the ability to flip backward again and again to absorb information at one's own pace.

Soon it is time for Chapter 3, "Assembling Your System." During this section, a mysterious blonde (throughout the tape she is shown only from behind) points out computer parts as the narrator gives detailed, but easy-to-follow directions on interconnecting cables and plugs. Like most other sections, the presentation is long and offers more facts than I can absorb. Yet, after having long considered computers unfathomable, I am relieved to hear their inner workings described clearly. In general, the tape is an excellent way of making computing accessible.

Chapter 5, "Using Disks," turns out to

be my favorite. After sitting inactively through four lessons, being turned loose on the board produces a feeling of liberation. The narrator explains how to put a new blank disk in the second drive for "formatting" and "initializing" to receive information from a DOS master. I do this, but am distressed to see the words "INVALID TIME" print out on the screen immediately after I insert the disk. The message, in glaring capitals, makes me feel a bit stupid. After much bewilderment, it becomes apparent that I have inserted the disk wrong side up.

My small calamity over, the rest of the chapter's exercises go smoothly. At the end the narrator tells me to select a musical program from the master disk's menu. Pressing a key and hearing "The Funeral March of the Marionette," "The Mexican Hat Dance," and Mozart's "Symphony No. 40" gives me a surprising thrill; only a few hours earlier I had been wary of the whole enterprise.

Chapters 6 to 10 ("Running Software," "Software Overview," "Application Software," "Basic Programming," and "Graduation") are densely packed with informa-

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tion. Aspects of the VisiCalc software program are explained. Ways to produce the Dow Jones report, UPI news briefs, airline schedules, and entertainment reviews at home are demonstrated. The narrator assures the viewer that only a few first-time users will be able to grasp everything in one sitting. I am certainly not one of the few. Yet I'm presently surprised at how much I have grasped, and sense I will be able to go back and learn the subjects I've missed.

A MYSTERIOUS blonde points out computer parts as the narrator gives detailed directions.

Advantages of Video Tapes

Nearly everyone agrees that learning computing from the PC manual alone is difficult. The question for other first-time users is "How does a VCR cassette such as *How to Use Your IBM PC in 10 Easy Lessons* measure up against seminars and courses of video disks?" Quite well, claims Lynch, though she adds that her company has no desire to downgrade other forms of instruction. She reports that customer response has been overwhelmingly positive. Users appreciate the fact that, unlike seminars and courses, the cassette imposes no time limit.

The tapes also have an important advantage to individual private users: Private viewing helps dispel the intimidation that many first-time users feel. San Francisco accountant Bruce Braden of Alexander Grant & Co., says he originally bought one to "... overcome my computer phobia. I knew I'd be a dinosaur real fast if I didn't learn to use one. But I found it more comfortable to be able to learn at home on my VCR." The embarrassments of first-time mistakes are also eased by learning in a private setting, an advantage that many users mention gratefully, Dudkowski says.

However, some experienced programmers favor video disks over video cassettes. They believe the disk's interactive

abilities—particularly in pinpointing where the user has made an error—make teaching more effective. They also praise the time-saving ability of the video disk's random access, in contrast to the cassette's serial access. Some consider learning in a workplace with experienced programmers around to be ideal; here too, learning problems can be dealt with individually. Competition for market share does not appear to be intense; the need for supplementary instruction seems to be strong enough to support several varieties.

Whatever the advantages of other learning methods, Kennen has reason to expect a good market. Since preliminary marketing efforts in February, Kennen has sold over 3,000 computer-instruction tapes of all types. (The company also produces tapes for the Apple II, Apple IIe, Apple II+, and Apple III.) Cassettes are available in both VHS and Beta formats. There are presently about five million VCRs in the country, according to Dudkowski. Presumably, there's a large overlap between VCR and computer ownership, fueling interest in this method. Dudkowski predicts that, "If anything, we're at the beginning of a trend. We'll see this use increase greatly in the next decade."

Sales of the tapes have been greatest to schools and businesses, although a substantial share of Kennen's market consists of private consumers. Major corporations that have bought the IBM PC tape include TRW Corp., Georgia Power, GE Connecticut, Hughes Aircraft, and Southern Natural Gas. Dudkowski says that IBM Boca Raton is using the tape for its employees and that other IBM corporate sites are investigating it.

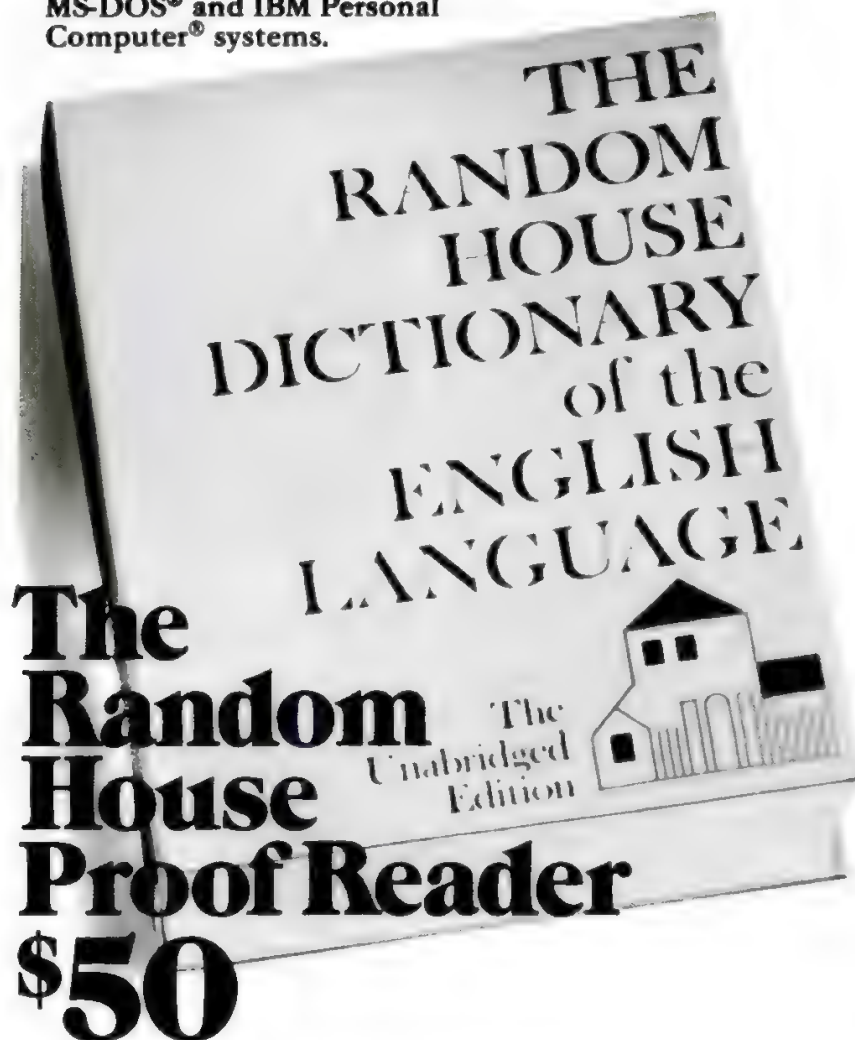
"Large corporations often buy 500 to 1,000 machines at a crack," says Dudkowski. "Then you have a situation where an executive walks into his office one Monday morning and finds on his desk an IBM PC, which he doesn't know how to use." In these instances, frantic calls are frequently made to Kennen.

Dudkowski and Lynch believe the company's testing process sets its tapes apart. After each draft of a script, first-time users are invited to come to try out a tape and test it. They are asked to keep a log of all unclear portions. "We bring in people who are afraid of computers—people who say things like, 'I'll never learn this'—and we literally lock them in a room with the

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computer and tape," says Lynch. "Many are amazed when they later emerge computer literate." Tapes are rewritten until first-time viewers report no problems understanding them.

P EOPLE
*who've had machines
for a week are upset
because they still can't
use them.*

Filling the Information Gap

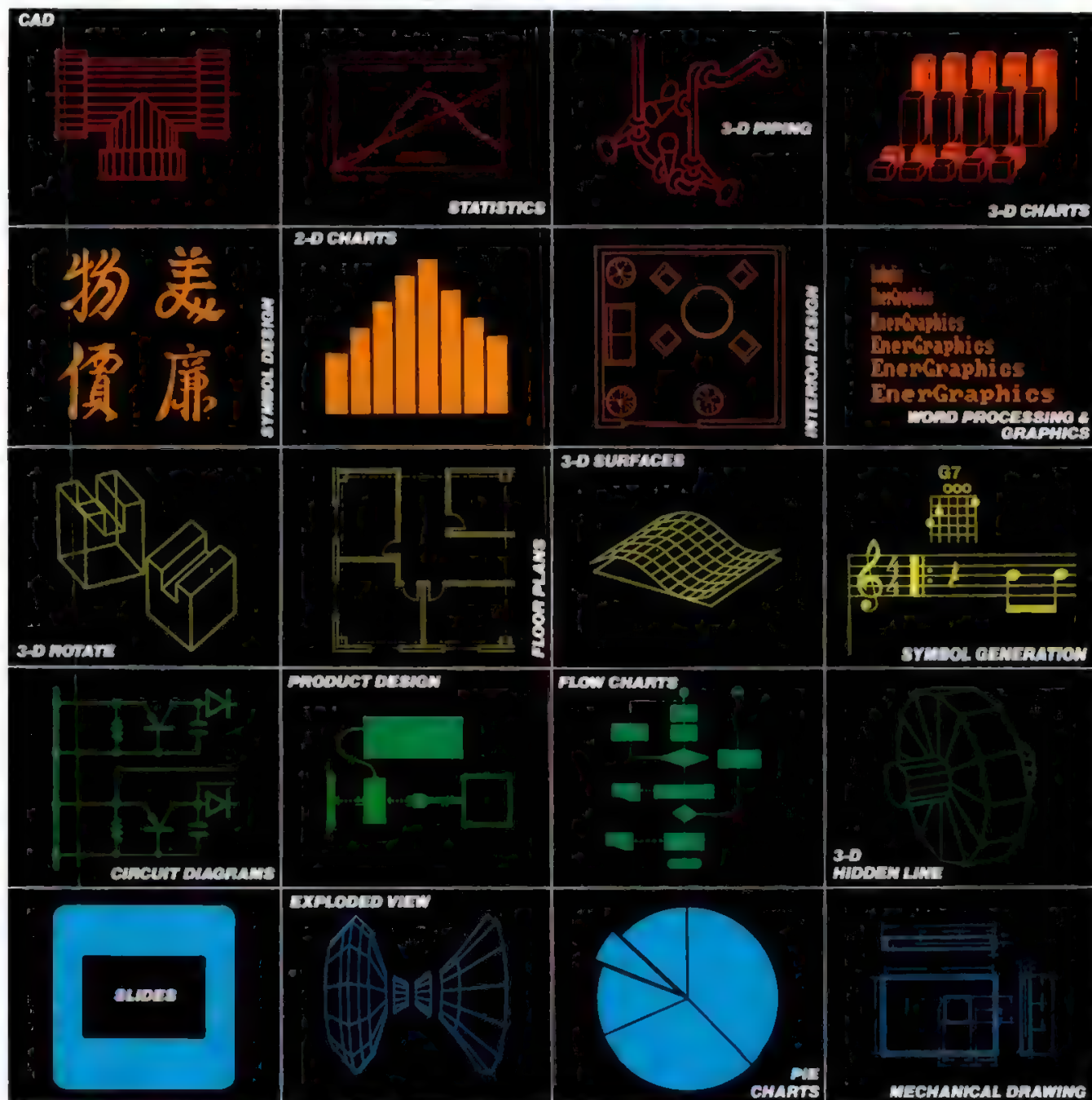
"We look at the tapes as a skeleton on which to hang all your scattered bits of computer knowledge," says Dudkowski. "We discovered that most people can't really learn computing from a manual, but that they often weren't getting what they needed from other sources. We also learned that computer manufacturers often incorrectly assume a high degree of knowledge on the part of owners. That may have been true when the industry was brand new and most of the purchasers were programmers. But there are a lot of people out there who need to know the basics. "We get a lot of calls from people who've had machines for a week and are upset because they still can't use them."

Dudkowski says that Kennen also tries to fill the gaps between the information contained in the PC manual and that given on software, another of the acute "information problems" of consumers. "Chances are, if you've just gotten a computer and go out and buy, say WordStar, you won't catch on that you're supposed to install DOS," he says. "If you're lucky, the dealer will do it for you. But we've found a lot of people who've spent a lot of money and have not been able to use their equipment because of basic information problems."

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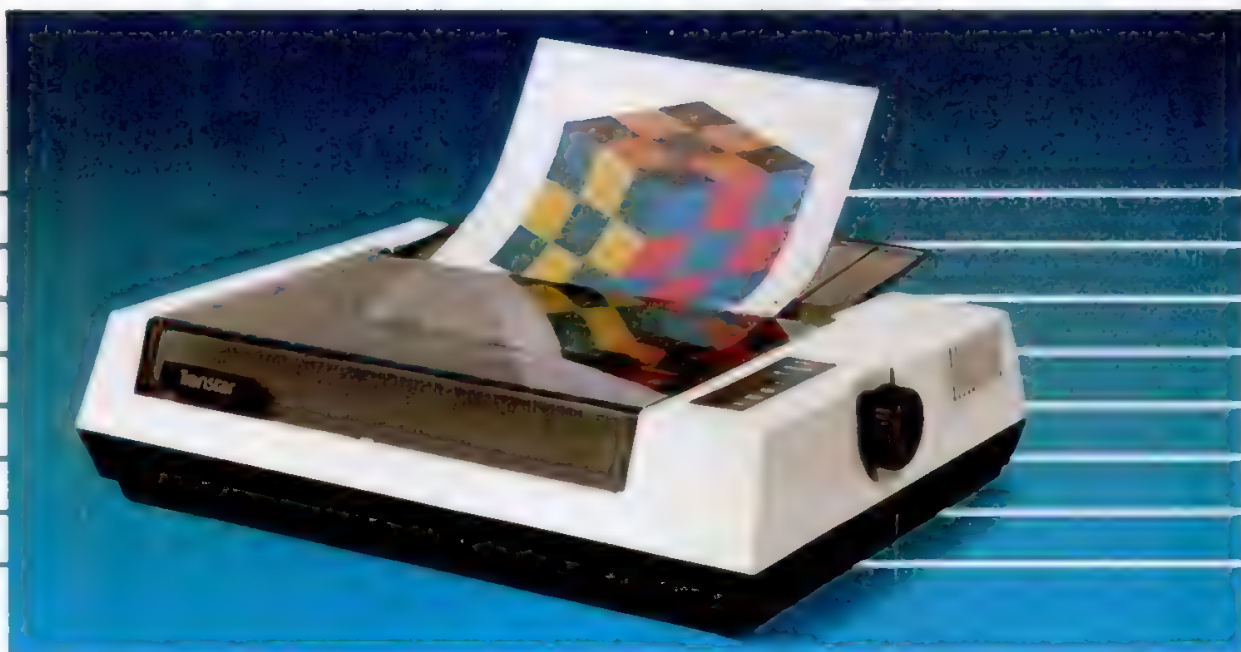
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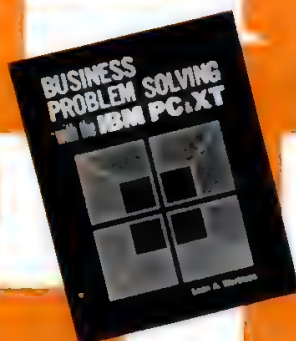
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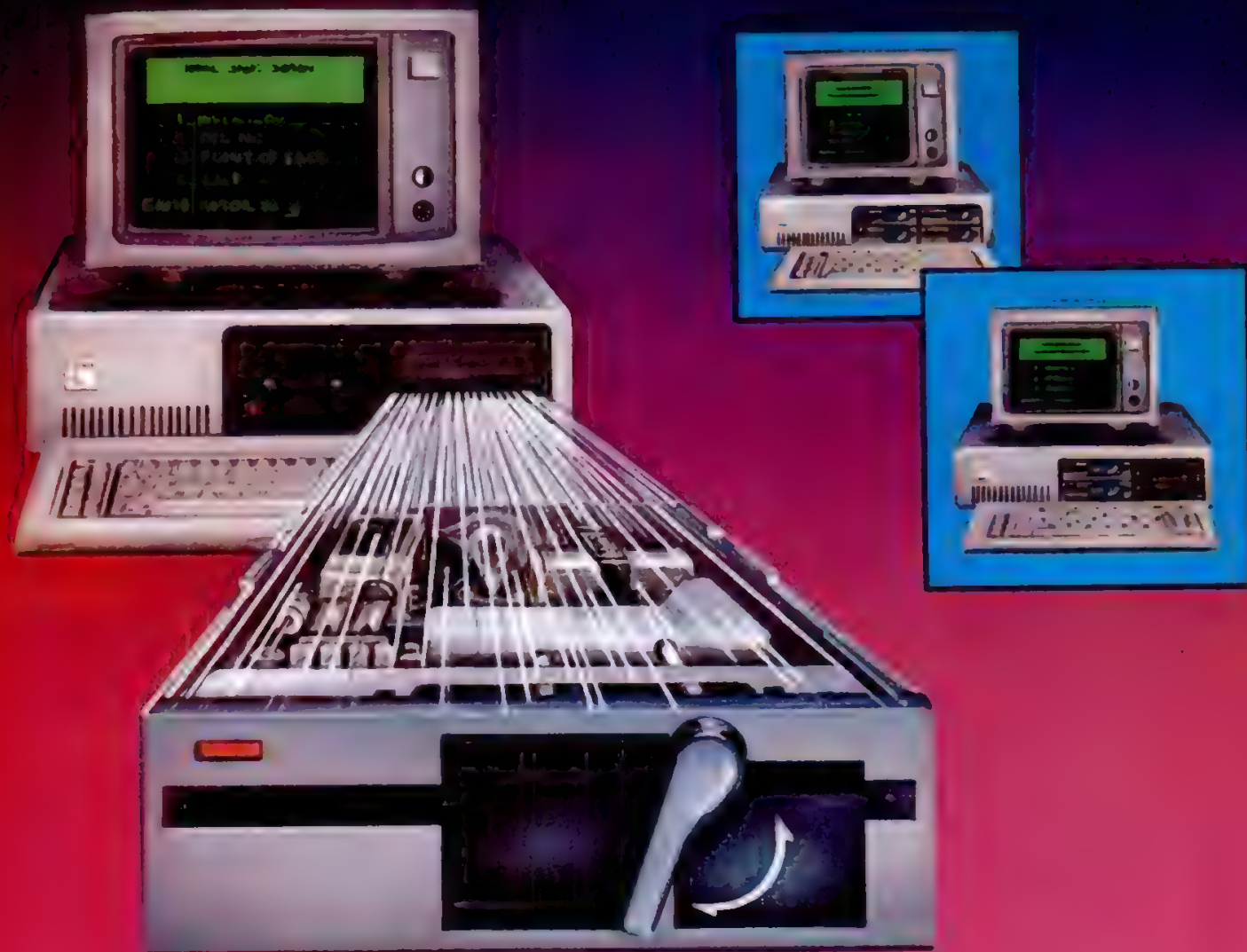
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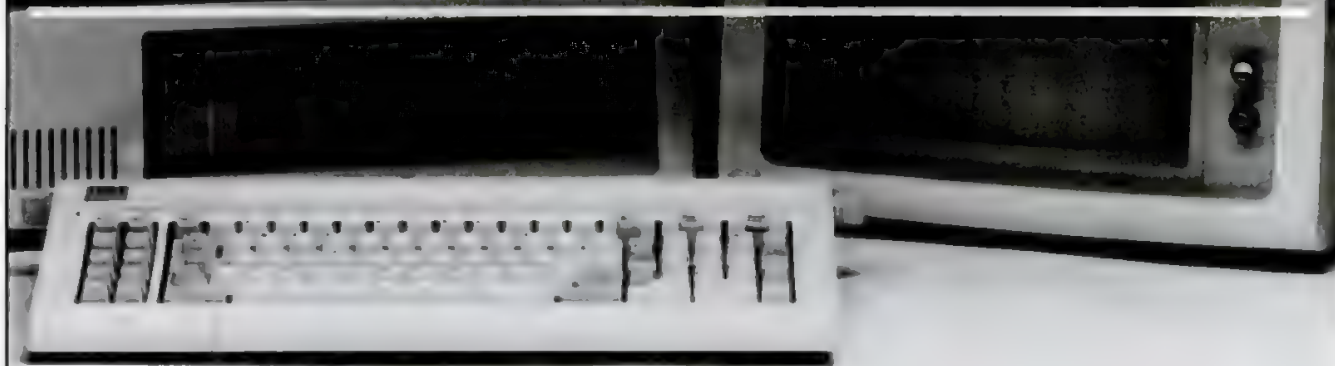
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The spreadsheet disappears from the screen. In place of the columns of names and numbers appears the face of a friendly, concerned gentleman, his hands on the keyboard of an IBM PC, the very program and problem you have on the screen before him.

"Having trouble with the Calculate function? Here, let me show you how it's done. The first thing you should do is to save an unaltered version of your numbers in case you want to retrieve them for some purpose. Just hit the F10 key—that's this key here—and the program will do the rest. I'll wait while you do this . . .

" . . . Well done. Now let's calculate. Type the F3 key to sum the rows—like this—or the F4 key to add the columns. . . ."

On the Horizon

It's no fantasy. Some developers say the next—and perhaps most valuable—training device for microcomputer owners may be a video disk player. This is by no means a completely new technology. Video disk players have been on the market for several years, and most contain pro-

grammable microprocessors that can be addressed by software. What is new is the combination of existing technologies and their application to microcomputer training programs.

The video disk offers two very important advantages as a training tool. First of all, it is essentially a random-access stor-



Larry Briggs, marketing manager for Timberline, runs through demonstration of Timberline's spreadsheet program on IBM monochrome monitor for Corey Sandler of PC. An instructional segment keyed to program is displayed in background.

age medium, like a floppy disk. Its laser technology allows the reading head to move quickly from the beginning chapter to the end and back again based on com-

How would a laser disk be integrated into an applications package?

mands from the keyboard or from an electronic index. This differs from serial storage media, such as video cassettes and audio cassettes, in which there is a significant loss of speed and flexibility because the tape must be wound or unwound from beginning to end to reach a particular point of information. The second advantage of laser disks involves the quality and flexibility of images. Resolution is claimed to be much higher than that presented by a video cassette player and the device can offer high-quality freeze-frame images, fast speed, slow motion, and reverse pictures. Top-of-the-line laser disk machines have been selling for as much as \$2,000.

How would a laser disk be integrated

into an applications package? A software author could include help-features codes that tell a disk player to display a specific video instruction on the computer screen or on an accessory monitor nearby. A video switching device would direct the proper signal—from the disk player or from the computer—to the screen. And, the disk player and its prerecorded lessons would interact with input from the keyboard and the contents of the computer's memory.

One of the first applications of the concept is working its way toward release at the end of 1983. Timberline Systems, Inc., an established software house in Portland, Oregon, plans to offer its dealers a ComputerActive Video System based around a laser disk player, a video controller, and a sales and training disk. Timberline, which has been producing financial and accounting software for minicomputers for more than 10 years, entered the microcomputer marketplace this year with its "Medallion Collection" of productivity and general accounting packages. First versions of the programs can run on the IBM PC, DEC Professional and Rainbow, IBM Displaywriter, TI Professional, Apple III, Osborne, Sage, and similar machines.

The Timberline effort is the result of a joint research and development program with ADI America (a California software

company), Sage Computers of Reno, Nevada, and ComputerActive Video, a Portland firm seeking to carve out a niche as a production company for laser disk training.

"We think the video disk player will become a peripheral to the microcomputer," said Larry Briggs, marketing manager of Timberline. "And we want our dealers to be able to use the device to demonstrate, sell, and train customers on our products now."



An image of spreadsheet program is shown in the foreground. To the left is the instructional segment, to the right the video disk player.

The View from Timberline

In a visit to Timberline's Portland offices, we saw an IBM PC running the company's spreadsheet program on a standard IBM monochrome monitor. Sitting next to the PC was a composite color mon-

Sears Catalog Goes Video

A streamlined new image for that old American standby—the Sears' catalog

Take a molded plastic disk that looks like a phonograph record but stores data rather than doo-wop. What is it? A video disk. Mix in the nation's largest retailers and you've got an updated version of an American classic: the Sears catalog on video disk.

In the summer of 1981, Sears put its 236-page summer catalog on video disks and distributed them in nine stores in the Washington, D.C. and Cincinnati areas and in about a thousand homes across the country in a marketing experiment. The company was testing two ideas: its customers' reaction to sophisticated video technology and its own ability to create it. Both the shoppers and Sears scored well.

Sears filmed 17,872 items from its



A shopper flipping through screens on Sears' Tele-Shop Catalog.

quarter-inch-thick summer catalog and packed them onto a disk that was about 12 inches in diameter, and only $\frac{1}{32}$ of an inch

thick. The heavy, oft-tattered book became the sleek Tele-Shop Catalog disk filled with images and motion and sound, playable on a television screen. In addition to still photographs of items like camping supplies and tennis shoes, Sears included 17 sequences that showed its products in action. Shoppers watched Cheryl Tiegs modeling her line of autographed clothing, for example, and saw close-ups of a Sears gas grill broiling a steak at a family barbecue. If these scenes sound like commercials, you may be right. Sears calls them "info-mercials" because they're "not hard sell."

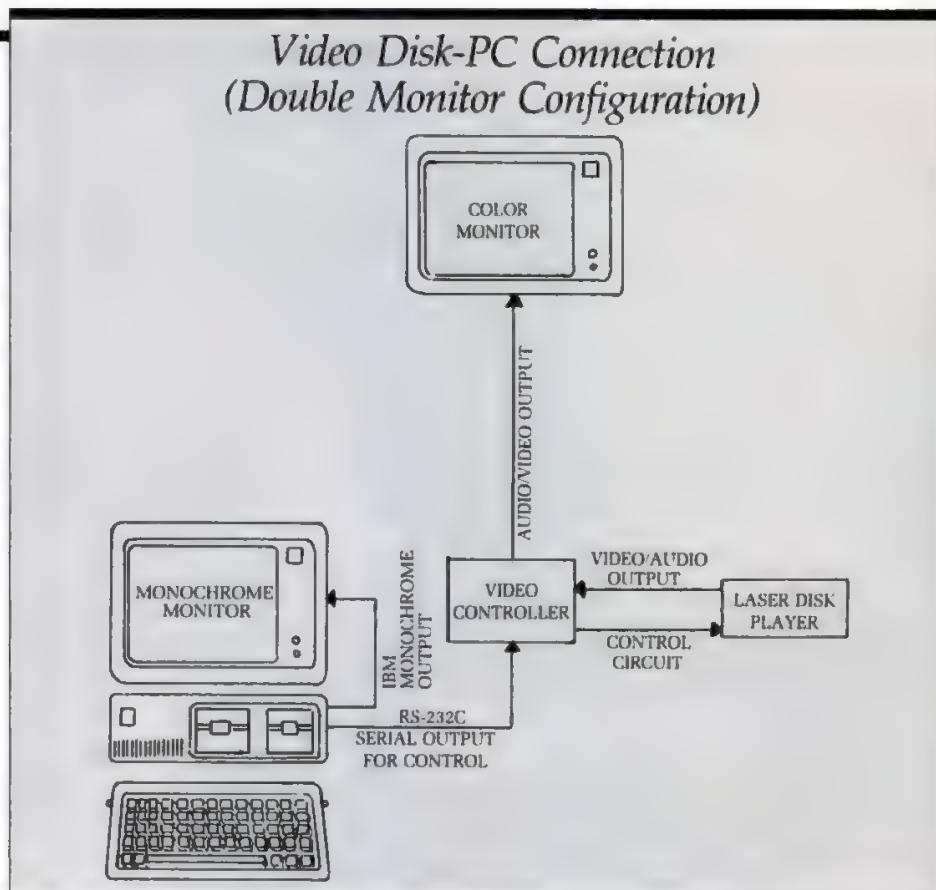
The video disk system operated on by menu scheme. Shoppers punched a key-board to call up a main menu of goods available through the catalog. If they chose

itor linked to a Pioneer laser disk player through a "black box" called the "Universal Video Controller," manufactured by Allen Communications of Denver. The PC communicated to the video controller through a standard RS-232C serial port and cable.

Briggs admitted to a few software bugs involving the UCSD p-System coding from the IBM PC to the video controller. As a result, most of the demonstration was conducted using a Sage microcomputer. Unattended, the video disk player showed Timberline's colorful mountaintop logo.

SOME
*developers say the next
 training device for
 microcomputer owners
 may be a video disk
 player.*

together with an invitation to a viewer to press any key to start the demonstration. The monochrome computer monitor had a similar invitation for the spreadsheet



application. Sending the signal from the keyboard triggered the computer's run-through of the program, interspersed with comments and demonstrations from the

video disk.

The version demonstrated used two monitors. It should be possible to have a system that would use just a single color

the category for "outdoor patio furniture," you'd see another menu from which you might select "table umbrella sets." From there, the color screen would display the Sears selection. If the pink- and green-striped job with the lace fringes looked like just the thing, the shopper would "freeze" the video display at a frame containing the necessary ordering information. The marvels of technology stopped there, however: It was still necessary to pick up the phone and dial in your request.

For Sears, the disk has several advantages. Video disks speed forward or backward at high speed or stop altogether to permit study of individual pictures. Then there's the "random access" feature: People can look at items in the catalog in any order they choose, with no need to flip through thousands of video entries before arriving at the desired product.

"It's a little like playing a video game on a television screen. You're in complete control," said Robert E. Wood, a Sears vice president for advertising and sales.

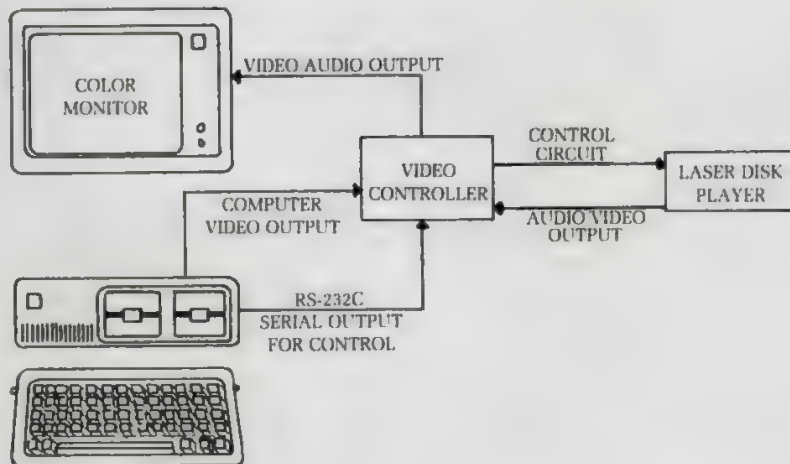
According to Sears' surveys, customers were pleased. Catalog sales didn't increase in the homes or stores with video disk catalogs, but they didn't drop off, either—perhaps a sign that people were using the machines. Far from feeling that technology was disrupting yet another old-fashioned American institution, people seemed to enjoy watching the video disk presentation. According to a Sears spokesman, one elderly woman walked away from her turn at the *Tele-Shop Catalog* announcing that the system was "Fun, fun, fun!"

One limitation of Sears' video disk experiment was that it didn't provide a way for shoppers to order directly from the screen. In other experiments, though,

the company has been moving in that direction. In Coral Gables, Florida, for example, Sears joined with the Times-Mirror Company to test viewer response to interactive cable advertising, perhaps a step toward putting the catalog on-line.

Sears stopped running its video disk test after the summer of 1981, but the company has high hopes for the future. After all, the general catalog has grown to 2½ inches thick, and Sears spends about three-quarters of its multi-million-dollar catalog budget on paper, printing, and mailing. The video disks may present a cheaper alternative. Catalog sales have increased in recent years, in part because working women who don't have time to shop are more likely to order by mail. With catalog transactions making up about 20 percent of Sears' \$20.67 billion sales, video disk merchandising is clearly an idea with a future. —Karen Cook

Video Disk-PC Connection (Single Monitor Configuration)



composite to RGB input, which may solve that problem. Another difficulty, though, may lie in the difference between the optimal viewing distance for a pictorial image as opposed to a text image. Viewers ordinarily watch television from farther away than the working distance for a monitor

ONE manufacturer is now offering a color monitor that can be switched from composite to RGB input.

monitor, substituting the training segment for the computer display. The present roadblock is the fact that output from the laser disk player is composite video, dif-

ferent from the monochrome signal or the RGB color output produced by the PC. At least one manufacturer is now offering a color monitor that can be switched from

for word processing.

Briggs said that the production costs for the group's 15-minute pilot ran about \$20,000. For their money, the partners received a total of five laser disks. Briggs said he expected the next version of the disk, which will include most of the first 15-minute segment, to cost another \$20,000 or so.

"The production costs are not miniscule," Briggs said. "But we see this as very important to our vertical marketing. We want to be identified as being on the leading edge, and we also want to sharpen our own skills."

"You don't just put a page of documentation on the screen. The video disk puts our training and marketing in a different light. We expect a lot of spinoffs to justify that dollar expenditure."

Timberline expects to have 200 dealers for its microcomputer products by the end of 1983, 600 by the end of 1984. Briggs said he expects that about half of these will opt to participate in the video disk program, which will include some sort of special purchase arrangements for the dealer. Based on today's prices, the player, monitor, disk, and controller will cost about \$4,000.

Whether Timberline's effort turns out to be a landmark in computer-based training and merchandising remains to be seen. However, the concept—from video disk, video cassette, or other source yet to be applied—may point the IBM PC in yet another direction.

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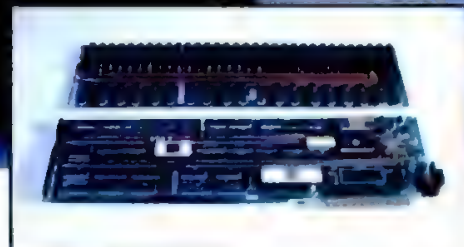
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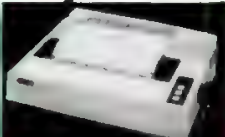
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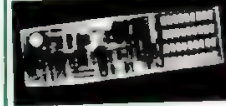
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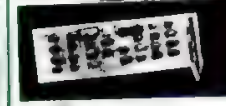
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Calculated Fields & Totals	no	✓	Output Only	✓	✓
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*PN Programming needed to provide this capability.

‡ In practice, disk capacity limits file size (e.g., a single sided disk with 200 characters/record will become full at about 700 records).



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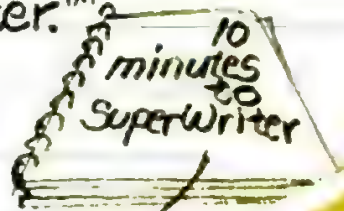
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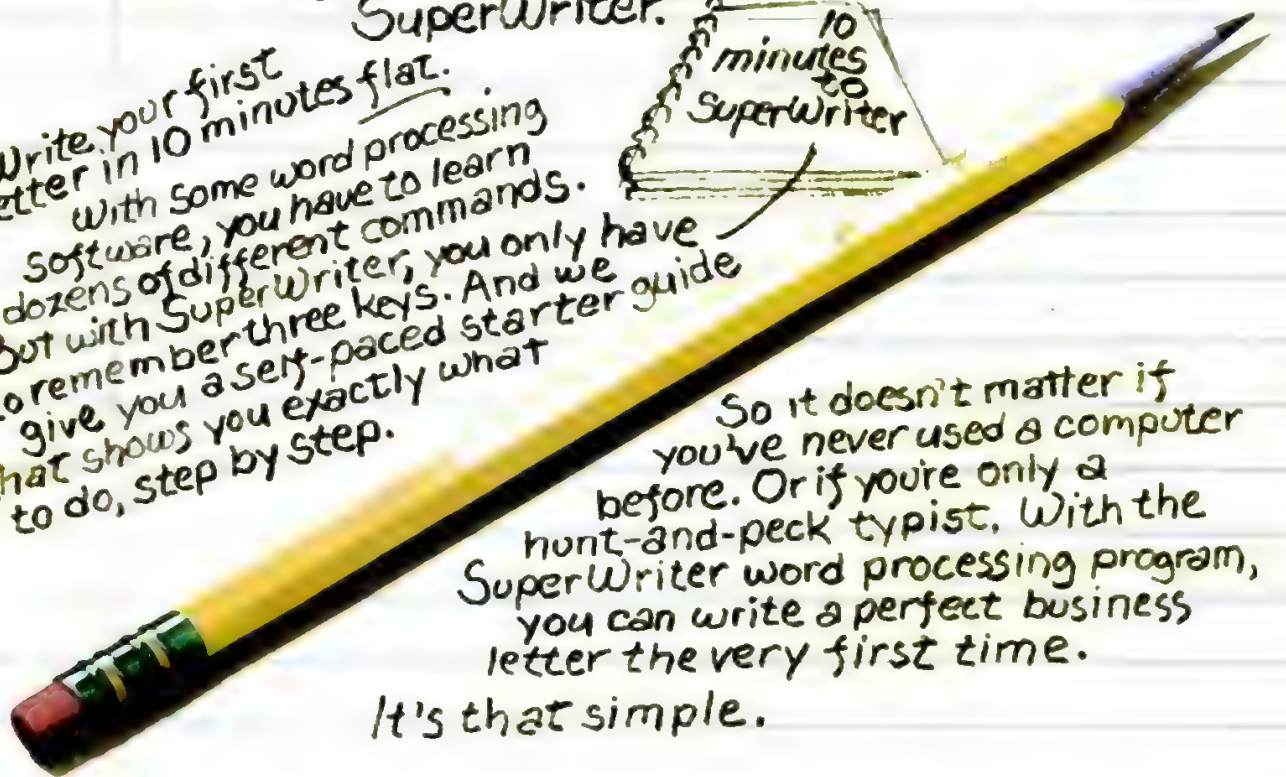
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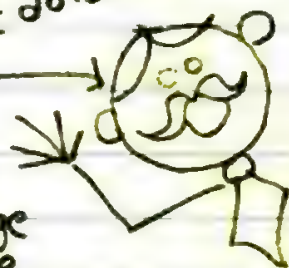


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Why can't computer manuals learn to speak?

We doubt if even *My Fair Lady's* Henry Higgins could provide the answer to that one. But it's the question on almost every microcomputer owner's mind. Many a would-be user has gotten no further than the opening pages of a computer program's "documentation" before retreating in panic to his trusty old typewriter and pocket calculator. Many an expensive program sits gathering dust on the shelf because the owner has given up all hope of mastery.

So, like Eliza Doolittle, we went to an expert in hopes of a bit of help. *PC Magazine* asked Sheila Tucker, an editor with an internationally known literacy foundation, to take a look at a sampling of popular manuals for the PC. Her grading and her comments on possible improvements would well be noted by the illiterate flower girls she found.

We also sought the comments of a frustrated, literate user. A. Scott Earle, a Shaker Heights, Ohio physician and author, sounds the call for a round of manual dexterity in the article that follows, "The Literate Idiot: A Reader's Best Friend."

If only the producers would listen—we'd all make it to the bank on time. —Ed.

There are fundamental rules for writing instruction manuals. In the rush to market, most technical writers have not bothered to learn or apply them.

Why Computer Manuals Drive Everyone Stark Raving Mad!

Manuals! Everyone has a horror story about some piece of hardware or software documentation. Many claim to ignore the manuals, at least as long as possible. Why are they so bad? Is it the writing? Or is it the reader? Perhaps it's a little of both.

As adults, we no longer learn the way we did in our youth. Children are constantly exposed to new material, and rely more on "fluid intelligence": the ability to perceive complex relations, engage short-term memory, form concepts, and use

abstract reasoning.

Adults rely more on "crystallized intelligence," which combines fluid intelligence with cultural knowledge. Adults look for familiar cues to guide them. An individual's outlook and personality can greatly affect his approach to learning.

The computer offers a whole new set of language patterns and symbols, which are unfamiliar to the average adult; this requires a return to the mental attitude of our youth. If a person believes he can deal

with a situation, it may be a challenge; if not, it may be perceived as a threat. Therefore, when the adult is suddenly thrust into a learning situation that requires fluid intelligence, manuals should be designed to present the information in a non threatening manner. Clearly-written explanations are needed rather than an overwhelming number of new terms and symbols. A person's ability to retain information in immediate access and short-term memory tends to be relatively stable dur-

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ing most of adulthood, but certain criteria must be observed. The material has to be meaningful, and the amount of information to be stored can't be too large for immediate access memory.

With this in mind, four manuals have been evaluated for readability: the IBM Guide to Operations, The Home Accountant, Hayes Smartmodem 1200, and dBASE II.

There are several indexes for evaluating reading levels. The Gunning-Fog index, which uses sentence length and word difficulty to determine the reading grade level, is one. The Fry Index (see Figure 1) is another. It uses sentence length and syllables to determine the level. Reading materials are also judged on layout, logical presentation, and writing style.

IBM Guide to Operations

Of the four manuals listed above, the IBM Guide to Operations (see Figure 2) wins the prize for readability, clarity, and layout. It is written at a 6.5 grade reading level and lists step-by-step procedures in clear, short, precise sentences. The abundance of white space on a page reduces stress and makes the manual look easy. This promotes confidence in the reader.

The text is complemented by detailed, explanatory illustrations. The IBM manual also includes notes related to possible problems and their solutions at the points

THE COMPUTER offers a whole new set of language patterns and symbols, which are unfamiliar to the average adult.

where they might crop up.

There is perhaps only one stumbling block in using this manual. You must know the exact features of your hardware to proceed through the various diagnostic tests. In fact, this is true of all four manuals evaluated.

Do you have one fixed disk drive or more? Is there a color/graphics monitor? A game control adapter? Can your hardware support an RS-232 interface? What is the

Figure 1: The Fry Index, which uses sentence length and number of syllables to determine reading level.

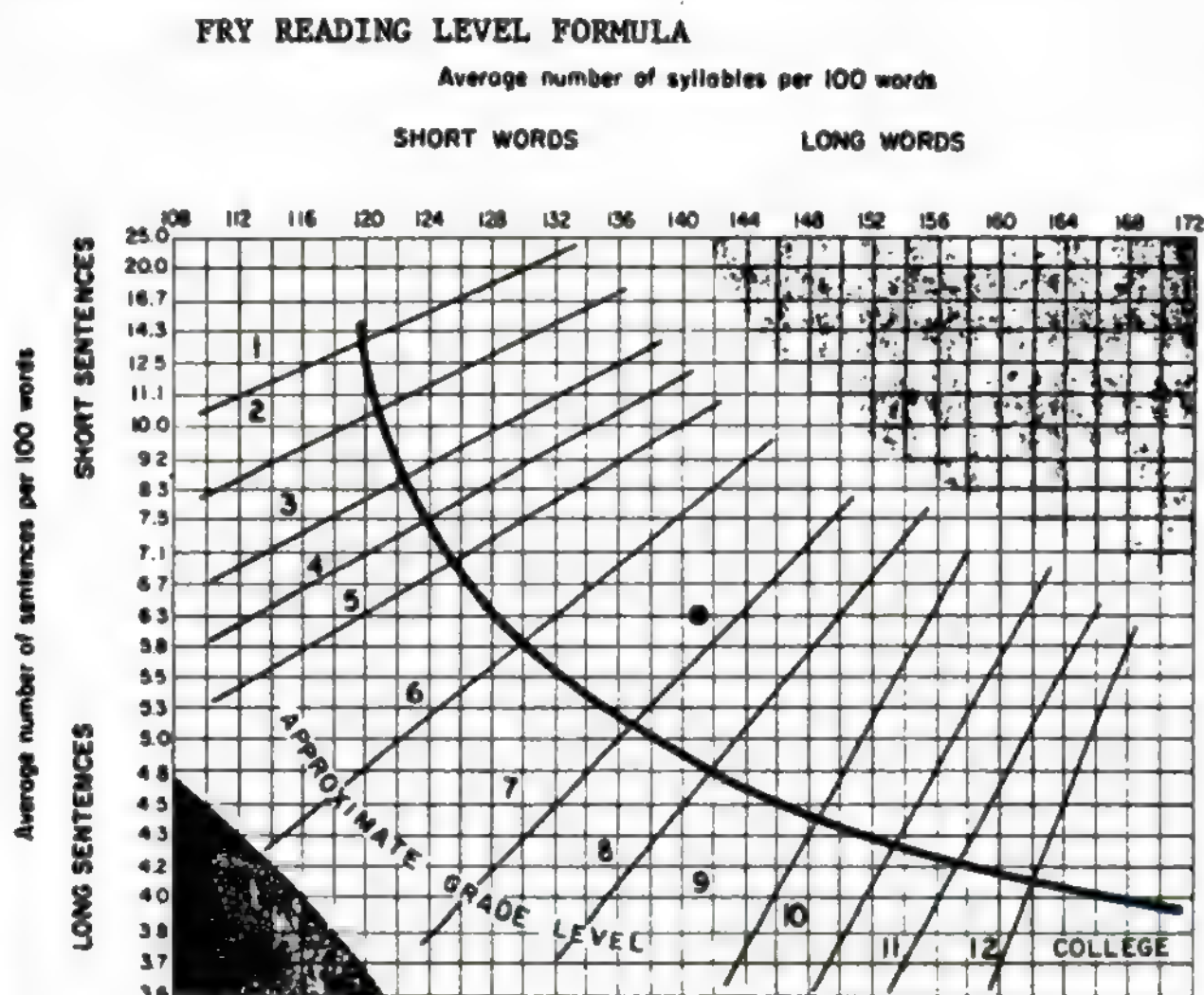


Figure 2: Excerpt from the IBM Guide to Operations.

- You cannot damage your IBM Personal Computer by pressing any key or combination of keys. You may not get the results you are looking for, but there is no way you can do any harm to any part of the computer, by pressing a key.

Figure 3: Excerpt from the Home Accountant Plus manual.

- Press any key after the blank diskette is inserted and the drive hatch is closed.

Disk drive B will whirr and buzz for a while. When the sound stops, the system will display a message to tell you formatting is complete. The message will also indicate how much space is available on the diskette if you are using DOS Version 1.10.

You now have a formatted diskette ready to receive data. Formatting completely erases a diskette, so be careful not to format a diskette that contains information you may need later.

NOTE: When you start a new system, *THE HOME ACCOUNTANT Plus* will not accept diskettes that contain any *HOME ACCOUNTANT Plus* data files. This feature is designed to prevent you from accidentally destroying important data.

range of transmission? A PC owner will remember some of these features, and of course he can refer to the manual. However, it would be handy if each manual had a page in front where you could check off the features of your hardware for ready

IN SOME instances you discover what you shouldn't do after you've already done it.

reference.

The Home Accountant Plus

The Home Accountant Plus manual is written at an eighth grade reading level. It assumes that the reader knows very little about computers and even less about the language of budgets. Terms are well defined, as are the various modules offered. The action instructions are in boldface, and the screen responses are

graphically separated from the text; both of these features increase readability.

There are, however, some problems in this manual. There is very little white space, making the material look more difficult than it actually is. Worse, in some instances, you only discover what you shouldn't have done after you've already done it. An example of this appears in Formatting a Data Diskette (see Figure 3).

After proceeding through 12 steps, you are suddenly confronted with the news that "Formatting completely erases a diskette, so be careful not to format a diskette that contains information you may need later." Obviously, it was assumed that you would read all the way through the instructions before formatting. Why not place this information up front for the benefit of the users (probably a majority) who would work through the procedure as they read?

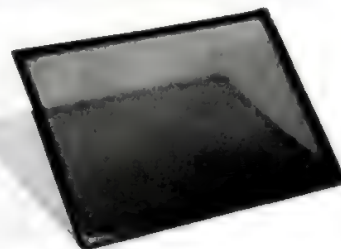
The Home Accountant Plus program does have some good features. It has logical codes: R stands for Run, X for Cancel, Y for Yes, and N for No. And the length of the manual is just about ideal. (Studies indicate that a program three times longer than another is nine times more difficult to read and comprehend.)

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Figure 4: The dBASE II manual: initial instructions.

Typographic conventions used in this manual:

Lowercase in the screen representations indicates material that you type in.

Uppercase in the screen representations indicates the dBASE II prompts and responses. In text, uppercase is used for dBASE II commands.

Figure 5: The dBASE II manual: function symbols.

PULL SCREEN EDITING FEATURES:

ctl-X moves cursor down to the next field (or **ctl-F**).

ctl-E moves cursor back to the previous field (or **ctl-A**).

ctl-D moves cursor ahead one character.

ctl-S moves cursor back one character.

ctl-V toggles between overwrite and insert modes.

ctl-G deletes the character under the cursor.

<Rubout> deletes the character to the left of the cursor.

ctl-P toggles your printer ON and OFF.

ctl-Q quits and returns to normal dBASE II operation without making changes, even in the MODIFY mode.

The Hayes Smartmodem 1200 Manual

The Hayes-Smartmodem 1200 manual is written at a tenth-grade reading level. It assumes that you have thoroughly researched your communication needs and that you have some idea of what this system will do for you. There is no question that technical knowledge of the hardware is necessary. You must be able to adjust the transmission speed of your equipment to use this remote system. If you do grasp the technical details, you should have no difficulty implementing the system with this manual.

The dBase II Manual

The dBASE II manual is a different matter. It appears not to have been designed for human consumption. It inspires an overwhelming urge to summon the PC owners of the world to unite, seize the programmer and the manual writer, and place them in a rat maze so that they may experience a little of the stress and frustration that they create. The frustration begins with the initial instructions (see Figure 4). Why does the manual use uppercase letters to represent dBASE II prompts and responses in the screen representations, while using them for dBASE II commands in the text? How can the reader keep these conventions straight?

The reading level of this manual is

ninth grade but this tells you very little about the intelligibility of the content. First, blocks of uppercase text are hard to read because all the letters are the same height, and there is not much difference between the shapes. Lowercase, with its letters of different shapes and sizes, makes

THE dBASE II manual appears not to have been designed for human consumption.

recognition easier.

The typeface is not the only difficulty. The symbols used for the various functions (see Figure 5) do not lend themselves to free association. They are therefore difficult to remember.

It would have been easier if B had been used for "back one character," D had been used for "down to the next field," A had been used for "ahead one character," and so forth. The users of this manual will probably just resign themselves to copying this page and taping it to their computers.

The manual also supplies "informa-

tion" at the wrong places. "You'll find out about this as we go through dBASE instructions later in this manual." Why not tell us where? Or, on page 24: "You can also use 'SKIP'± (variable/expression), with a number of records skipped determined by the value of the variable or expression (both defined later)." Thanks!

READ the manual once over lightly before you begin in earnest.

Stress is built into the program itself as well. After a set of instructions, you are told that "QUIT" must be typed every time you terminate a dBASE II session. "This automatically closes all files properly. Unless you do so, you may destroy your database." Destroy your database? Why wasn't something said about this earlier?

Another example of a stress cue appears on the bottom of page 28. In a note about the command 'PACK', you are told, "Once you use this command, the records are lost forever." Unfortunately, this information may come too late to prevent you from dispatching your records to the great bit bucket in the sky—"forever."

However, you can deal with this stress, and overcome the confusion in this manual:

- Read the manual once over lightly before you begin in earnest.
- Work in a comfortable, properly illuminated environment.
- Relax. There is no need to rush.
- Use different colored pens to underline commands and responses.
- Highlight those dangerous commands that can wipe out your efforts.
- Resign yourself to taping a copy of the major codes to your computer for ready reference.

These techniques can be useful for any manual. You can be in control. It's just a matter of mind over manual! /PC

Sheila Tucker is a textbook editor with Laubach Literacy International, a company that publishes material for the new adult reader.

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CIRCLE 209 ON READER SERVICE CARD

New Rule: Henceforth, program designers may not write their own documentation. Manuals should be collaborations between techno-geniuses and literate idiots.

The Literate Idiot: A Reader's Best Friend

One of the biggest and most time-consuming frustrations faced by microcomputer users confronts them when they try to unravel and make sense of the directions—the “documentation”—that accompanies software. Apparently few users are spared; it's not at all unusual to read a review that praises a program while damning its documentation. Is this discrepancy in quality between programs and the instructions that accompany them necessary?

If you are a new IBM PC user the following scenario is probably a familiar one. You order a program that was well reviewed—one that “might be useful to any PC owner.” The reviewer mentions that the documentation was not the greatest, but that this deficiency was more than offset by the program's value.

The diskette arrives in a neat plastic folder with a six-page booklet of

instructions that is, fittingly, reproduced from a computer printout. The booklet tells you that you are the owner of a program that is “innovative and useful . . . allows you to take full advantage of the programmable nature of the IBM PC keyboard—without having to be a programmer.” The manual goes on to say that the program is “an on-line macro processor.” It provides no explanation, however, as to exactly what a macro processor (on-line or otherwise) actually is.

The directions continue. Terms like “file write, not a merge,” “hardcopy reference,” “string definition,” and “scans its own playbacks,” are piling up one on top of the other, but there are few examples in the manual that might help to explain what any of these things are.

It costs you a great deal of time to figure out how to use some of the simpler commands. Others, like storing and retrieving

files, remain a mystery. You suspect that there might be a lot of things that this program could be used for if only the documentation were a bit clearer. Finally, in desperation, you call the software company for help.

This scenario occurs so often in the lives of new PC users that it seems to be

part of an obligatory electronic initiation into the frustrating world in which new computer users live.

Recently, totally thwarted in my attempts to learn how to use a program, I wrote to the software company for assistance. I did not condemn the program as such—indeed, it did eventually turn out

to be very useful—but I did condemn the documentation.

The return letter from the president of the company did not come right out and say that I'd kicked the baby, but I got the idea that he thought so. There was also a whiff of sarcasm in the instructions included in the letter, most noticeably where he mentioned that "the word <enter> means to press the gray key with the hooked arrow on it—just above PtScr." This experience somehow summed up all of the frustration that I—and many other PC users—have experienced in trying to decipher the instructions supplied with programs.

Wasted Potential

Today, new programs of general interest are reviewed in computer magazines and even in newspapers. The New York Times has a computer column; so does my hometown Cleveland Plain Dealer. Buyers usually have a pretty good idea what they are going to get when they plunk down cash for new software. Unfortunately, a lot of this software is used far below capacity. This is often not the result of poor selection on the buyer's part, but of his inability to figure out how to use the program.

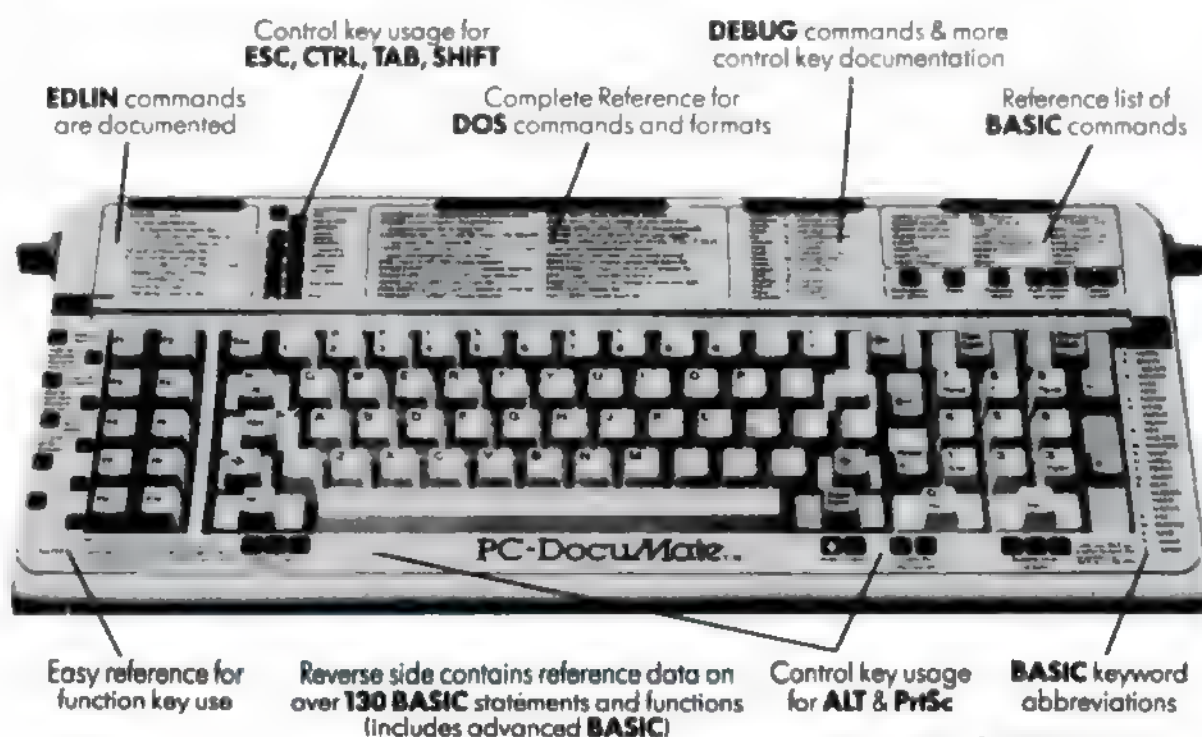
Too many programs are shot down by their own authors, who believe they can explain how to use their creation. In most cases they're wrong. Creating and explaining are separate talents and they require separate approaches. An author who writes a program designed to be used by others should assume that the end-user really knows nothing except that the program was designed to carry out certain functions. It should go without saying that a buyer ought to be provided with directions that are clear enough to enable him

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THE WORD
<enter> means to press
the gray key with the
hooked arrow on it.

to use the software.

In the real world, however, the personal computer user is often disappointed and frustrated as he tries to decipher the

documentation. Time is simply too valuable—especially for professionals, many of whom now own IBM PCs—to invest hours and days compensating for inadequate

THOSE WHO
*are writing the manuals
and the booklets simply
know too much.*

quate and incomplete instructional material. This may make little difference to the software producer; he has his money. This myopic attitude won't help much if you're trying to build a software empire.

One of my physician acquaintances recently told me that he had purchased a database management program written especially for the PC. He knew nothing about databases, but he did know that he wanted to put together a list of patients with similar diagnoses. The author of the program wrote that he had "one overriding goal in mind. Ease of use." The buyer was assured that most people would be able to use the program with no training or instruction. Then the manual really took off: into data fields, clones and reports, subsets, sorts, index rebuilds, shell sorts, and record layouts. And there was not a single definition, not a single key-by-key example to define the terms or explain the use of any part of the program. The diskette is just gathering dust.

Could the instructions for this program and others be written so that they could be understood by a noncomputer person of average intelligence? The answer to this question is of course "yes," but it is not easy to do.

Modest Proposals

The following guidelines for writing program documentation might help solve some of the time-consuming start-up problems that many encounters.

- "Documentation" should be informative; all necessary information should be included in the simplest possible manner. A new owner should be able to use the program effectively after reading the instructions. Trips back to the store or let-

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CIRCLE 402 ON READER SERVICE CARD

ters and phone calls to the software provider should not be an obligatory part of owning a piece of software. One new PC user found that the manual that came with his word processing program did not even tell him how to load the program. Evidently, loading was felt to be so easy that instructions would be superfluous. Well, it is easy—when you know how.

- Every term that is unusual, and every common word that is given a special meaning, should be clearly defined. For example, more and more people who really don't know very much about word processing are beginning to use word processing programs. Many of them haven't the haziest idea of the meaning of such simple terms as "default," "line feed," "hard and soft carriage returns," and "hard and soft hyphens"—and you can look in vain for definitions in some of the program manuals. Glossaries are needed. These are boring to write, but new users are entitled to simple definitions.

- Examples should be provided of how to carry out each step, key by key. Put

them in a special appendix if necessary, but the new user needs this kind of help. Key-by-key examples can help the user make sense out of parts of the main documentation that were obscure previously. For example, the WordStar Training Guide can be a lifesaver. The WordStar manual may make sense for some users only after they've mastered the key-by-key applications in the Training Guide.

- Instructions should be pleasant to read. They should be interesting enough for the user to want to read them; using the instructions should not be a last desperate measure. Such documentation does exist; a good example—although it's not for software—is the Epson MX80 manual by Dr. David Lien.

Why is there a problem with documentation anyhow? Programmers and computer engineers are intelligent. So presumably are users. Why, then, is it so difficult to explain in writing how to run a program? The answer is that those who are writing the manuals and the booklets simply know too much.

What is really needed during the preparation of documentation is a collaboration between the individual who wrote the program, and a literate idiot who

MORE AND more computer illiterates will be punching the PC keyboard in the very near future.

doesn't know anything about writing programs or building computers, an idiot who has to sweat to make the computer, the printer, the software, or whatever, do what they are supposed to do. An idiot—I'm not proud, I'm one myself—who has made every stupid mistake possible, who has an inborn ability to misunderstand the simplest instruction, for whom an open line to Computerland is a necessity. Such a certified computer idiot has something important going for him; he can communicate in a meaningful way with other computer idiots. This is the person who should be writing the instructions.

Someone who is comfortable with computers may not be comfortable with or adept at language. Indeed, for many individuals, mental ability in one area seems to be inversely related to mental ability in another. (Have you ever noticed how many spelling errors there are in computer programs and documentation?)

Computers, their peripheral hardware, and the growing mountain of available software deserve good documentation. Poorly written and inadequate instructions are a problem for everyone. This article is a plea; a plea for directions (okay, documentation) that can be understood. Directions written by someone who can write tolerably well, and who can explain in intelligible terms how to get from A to B. Ready or not, more and more computer illiterates will be punching the PC keyboard in the very near future. I suggest that it might be worthwhile, when a program is completed and it's time to write the documentation, to have at least some input from a computer idiot with verbal skills.

/PC

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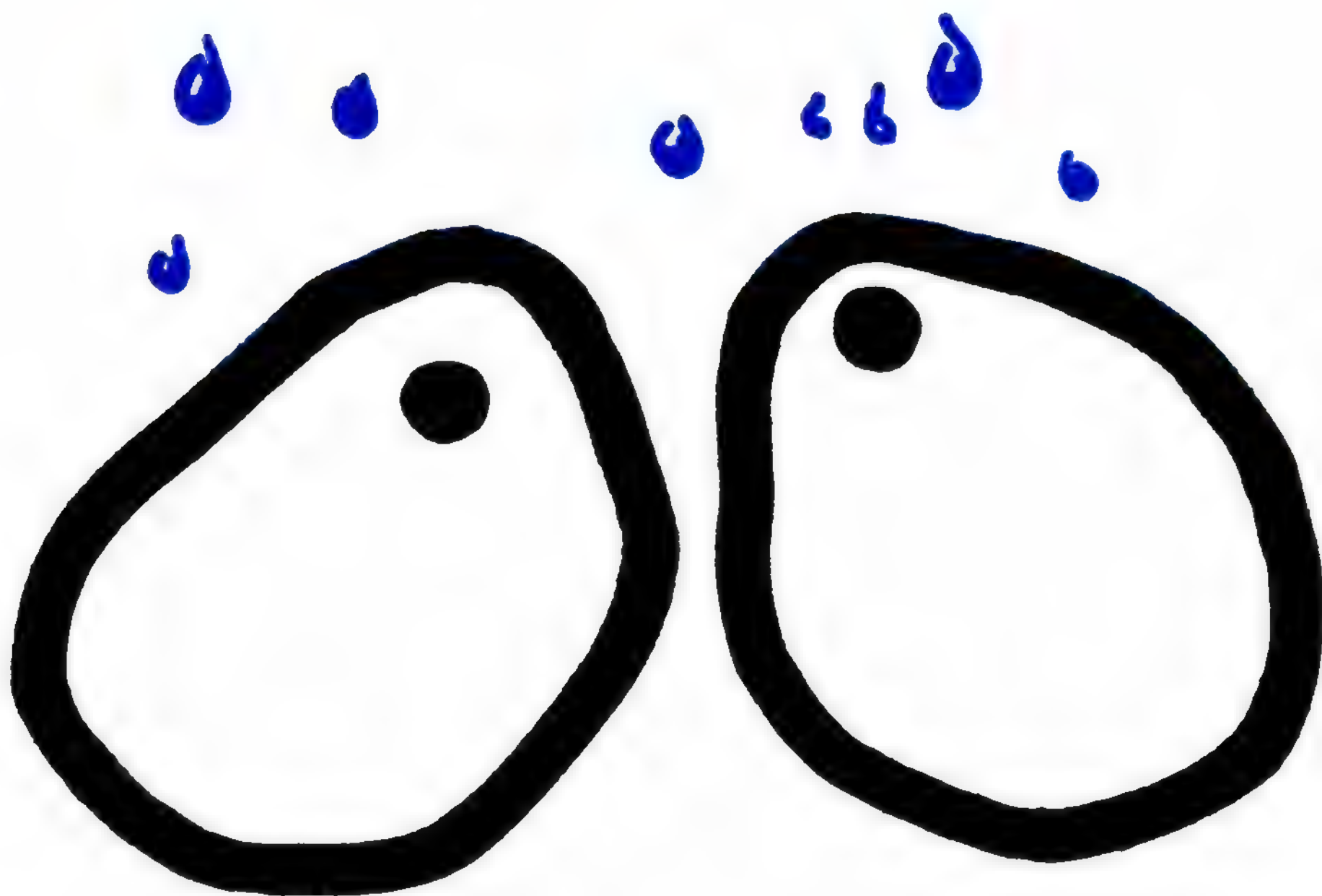
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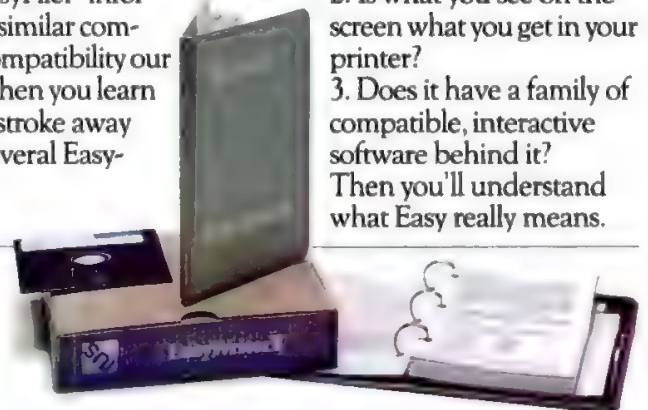
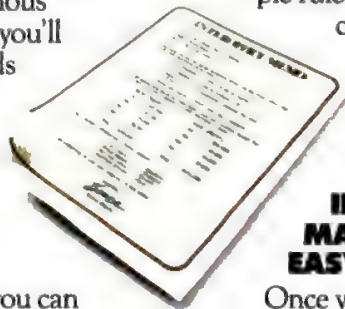
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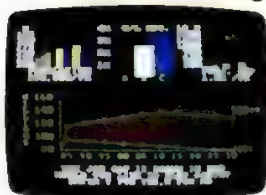
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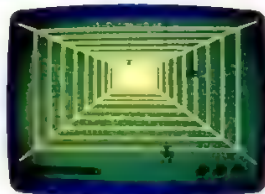


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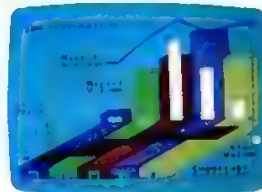
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CIRCLE 368 ON READER SERVICE CARD

While a Local Area Network can offer marvelous facilities, a LAN may not be the answer for everyone with multiple microcomputers.

To LAN Or Not To LAN

Local Area Networks (LANs) are wonderful things. Everybody with two or more PCs needs one, right? Wrong! Not everyone with several microcomputers needs to network them together, and even those who would benefit from a LAN might not be served well enough by those available today. We need to look at who needs a LAN and who doesn't. After we separate the needs from the wants, we'll examine what the market offers now for the IBM PC and what the future might bring.

To LAN or Not to LAN?

Having written a book on local area networks and being presently involved in selecting LANs for installations ranging from embryonic to enormous, I am obviously enthusiastic about the technology. LANs have helped me professionally, and they have helped me make money—but I would be the first to say that they aren't for everybody. If you have a number of micros and you just want to swap files and programs, a LAN may not be what you need.

The transfer of program and data files

between computers has been a problem since the first computer found a mate. The problem is aggravated for microcomputers, as well as larger systems, by the number of operating systems and disk formats that exist. A program will not run on two physically identical computers if they are using even slightly different versions of an operating system. The problems with disk

THE MOST
effective user of a LAN
is an agency or
organization needing
simultaneous access to
a changing database.

formats range from differences in physical size to differences in the location of the directory track on otherwise physically identical diskettes.

Both the way the operating system organizes files and the physical disk characteristics can limit the transportability of data files. If you want a local area network to help you with program and file traffic between even slightly different systems, you are probably in for a rude shock. A LAN is not designed to abet program transportability, and many microcomputer LANs will not even provide data file portability between terminals using different operating systems.

Today's garden-variety LANs do not provide a magic interface that will allow a free flow of data between unlike machines. They are primarily devices that provide separate users with the ability to access separate portions of the same hard disk. They will, with some limitations, allow the sharing of common files between nearly identical individual terminals. They require an investment of space, time, and money to do this, but in some cases, it may be worth the trouble.

You Don't Need One if. . .

You don't need a LAN if you plan to do

real-time sharing of information. If you have five authors who are working on related but separate documentation or articles, you can probably save the cost of

YOU DON'T need a LAN if you don't plan to do real-time sharing of information.

a LAN by sharing the data on floppy disks.

You don't need a LAN if your multiple micros are using data files that don't change frequently. If you make relatively few changes on mailing lists, standard forms, or other static data, the weekly or monthly updates on floppy disk would be sufficient.

Finally, you don't need the more commonly known of the IBM PC LANs to share data with other microcomputers. If file swapping is what you need, I suggest you use the RS-232-C serial port and file transfer programs such as Microstuf's Transporter and Crosstalk. These programs, available for multiple operating systems, will allow you to share data between unlike machines.

If you think you need a LAN for electronic office services such as executive support (addresses, calendars, etc.) or electronic mail, you are a fence-sitter in today's technology. Right now, the best packages in this field are designed for centralized minicomputers that take care of the needed message storing, notification, and log keeping. The software to do this on local area networks is growing, but it isn't widely available or supported.

You Need a LAN If...

You can probably justify a LAN on a cost basis if you already own a single PC with a good-sized hard disk (10 megabytes minimum) and want to make the hard-disk capabilities available to other PCs.

The most effective user of a LAN is an agency or organization needing simultaneous access to a changing database. Networks are useful for reservation services, parts warehouses, and processing plants. If you have large data files that are fre-

quently updated or if you want centralized control over the data, you can make good use of a LAN.

However, there are thorns among the roses even with this kind of optimum-use LAN system. It helps to picture a micro-computer LAN as having all of the users connected to a bank of large-capacity floppy disk drives. Each user has one drive assigned. The individual user can see a directory of the other drives and can copy files from other drives, but if two users work together on the same drive, they must do it like porcupines making love—very carefully!

Current systems require special software to perform a function called "semaphoring." This function is just as primitive as the flag signaling system it is named after. If two or more users are simultaneously working from the same file, the individual operating systems can each try to open, close, and size the file as if it were the only one that owned it. Semaphoring is a primitive protocol system telling each user the status of other users and files. The intent of this system is to

prevent the intermixing, overwriting, and resizing of files by the operating system of a single user. However, it doesn't always work.

The safest operating procedure to use with today's disk-sharing networks is to copy files from another work space and use the copy in your own area. A system designed for multiple users accessing shared data files may actually keep many copies of those files for individual users.

If you fall into the grey area of users who need executive support and electronic mail capabilities, you should look at your database access needs to see if they fit the criteria of frequent access to changing data. This might help you decide between using the common PC LANs and other systems.

The Market

If you are an IBM PC user you can divide the LAN industry into two groups: those that have systems designed specifically for the IBM PC and those offering systems designed for any serial device. The latter group includes the digital pri-

Product Information

The following local area network systems for the PC are mentioned in this article.

Omninet

Corvus Systems, Inc.
2029 O'Toole Ave.
San Jose, CA 95131
(408)946-7700

CIRCLE 683 ON READER
SERVICE CARD
PCnet

Orchid Technology
497 Sinclair Frontage Rd.
Milpitas, CA 95035
(408)942-8660

CIRCLE 682 ON READER
SERVICE CARD

EtherLink

3Com Corporation
1390 Shorebird Way
Mountain View, CA 94043
(415)961-9602

CIRCLE 681 ON READER
SERVICE CARD
Plan 4000 Network

Nestar Systems Inc.
2585 E. Bayshore Rd.
Palo Alto, CA 94303
(415)493-2223

CIRCLE 680 ON READER
SERVICE CARD
ShareNet

Novell Data Systems
1170 North Industrial Park Dr.
Orem, UT 84057
(801)226-8202

CIRCLE 679 ON READER
SERVICE CARD

vate automatic branch exchange (PABX) telephone systems capable of carrying voice and data. It also includes systems using stand-alone and specialized devices

SPECIFIC portions of the hard disk must be formatted especially for each class of users.

to interface a typical serial terminal with the data bus. You can, with some care and advice, use your PC on these systems and exchange data files with "foreign" devices. This is the thrust of the large commercial LAN industry. But most of the action in the microcomputer industry seems to be with products customized for the IBM PC, so let's look at them and see what is offered.

PC-Specific Networks

Generally the IBM PC products allow individual systems to share a hard disk drive. The various system users can read and copy each other's files. Each individual user's system thinks it has its own dedicated hard disk.

These systems can host a mix of dissimilar users, but specific portions of the hard disk must be formatted especially for each class of users: IBM format for IBM users, Apple format for Apple users, and so on. This means that IBM PC, Apples, and CPM machines can often all operate on the same network; however, files can be shared only between like users.

Some LAN packages include special applications software that can perform electronic mail functions. The vendors may also include software allowing data to be buffered or "spooled" for faster access. Other companies are developing software designed to share files for executive support and electronic office functions. You need to look at every aspect of a prospective LAN—from the size of the wire and connectors, to the applications software available for your configuration. Take nothing for granted because this is a new industry with plenty of holes yet to be

filled. There are, however, some companies who are working hard to solve your problems.

Corvus

Corvus Systems claims to have more microcomputer LANs operating than any other vendor. Its Omninet system was a natural extension of its work on hard disk drives. The Corvus Omninet can host both IBM PC and Apple II microcomputers, but the data used by different types of machines resides on different portions of the disk; it is not readable from one kind of machine to the other.

The media for the Corvus system is twisted-pair RS-422 cable. You can put 64 stations on the network and have a maximum distance between the stations of 4,000 feet.

The transport card that is inserted into the PC contains its own Z-80 microprocessor card and network interface software. Transporter cards are needed for each node. Each transporter card for IBM and Apple systems costs \$495.

The Corvus disk is a stand-alone unit that includes a transporter card, disk support hardware, power supply and fan, and the disk itself. The prices for the disk unit range from \$2,295 for a 5.9-megabyte hard disk to \$4,295 for an 18.4-megabyte system. Multiple disks can be used on the network.

Orchid

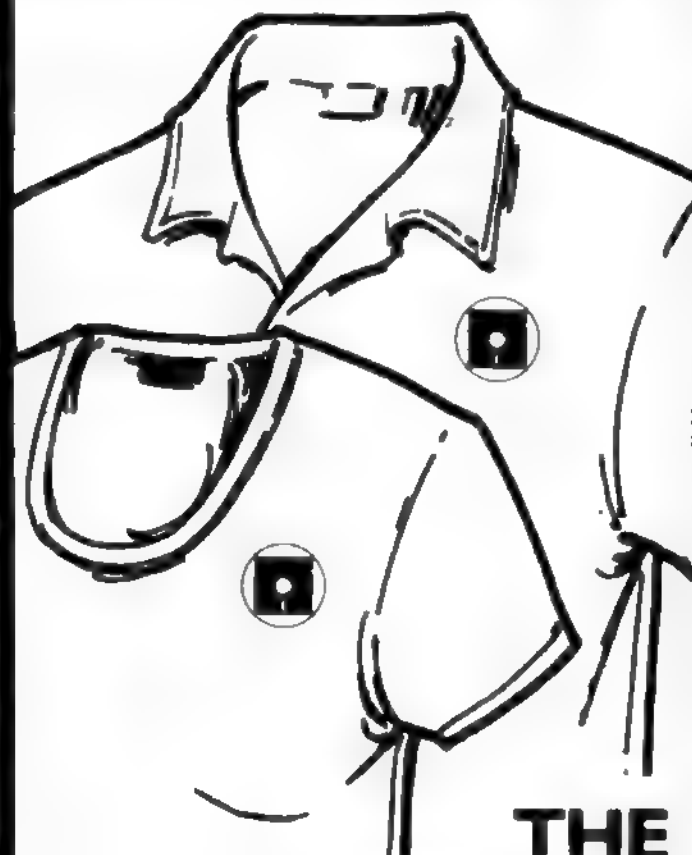
Orchid Technology has been shipping its PCnet for the IBM PC since November 1982, and it claims to have over 1,400 interconnect cards in the field. The system offers two major features: the ability to use a wide variety of hard-disk drives and the ability to share the disk on an IBM PC-XT. The disk sharing on the XT is done as a background task. This means that the XT's operator normally is not aware that the machine is serving as a host.

If you own an XT and a standard PC, you can buy a starter kit from Orchid for \$1,495 that includes the two PCnet adapter cards, the software, and 20 feet of coaxial cable. Additional PCnet adapters cost \$695. Up to 200 stations can be attached to this coaxial cable system over a maximum distance of 7,000 feet.

3Com

The 3Com EtherLink system was described in depth in PC, Volume 1 Number

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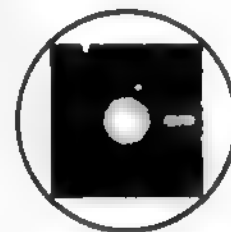


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9. This system uses the Ethernet protocol being pushed by Xerox, DEC, and Intel.

The IBM PC adapters for this coaxial cable system sell for \$950. The EtherShare 10-megabyte hard disk system sells for \$11,500. Various electronic mail and resource sharing software packages are available.

The network can consist of as few as two IBM PCs connected together for file swapping with EtherLink interface boards. This system can grow to connect to mainframe computers and over 1000 network stations.

Nestar

Nestar's Plan 4000 was also described in PC, Volume 1 Number 9. This system is one of the most complete local area networks on the market. It has software packages providing implementation of all of the International Standards Organization (ISO) model protocols. Nestar uses the Arcnet token-passing protocol developed by Datapoint and later adopted by Tandy for the high end TRS-80 systems. The higher level protocols follow the guidelines of the Xerox Network Systems.

A Plan 4000 interface board for the IBM PC costs \$595. These boards must be used with a central file server. A typical centralized file server for a Plan 4000 network is a 60-megabyte drive with tape backup, costing \$22,500.

Plan 4000 is designed for big users who want to combine IBM, Tandy, and Apple computers on single network. It can support 255 users on each system segment and various segments can talk together.

IBM recently designated Nestar as an approved value-added dealer for the IBM PC systems. This means that Nestar can sell complete LAN packages, including the PCs, to large accounts.

Novell

Novell Data Systems is entering the IBM PC LAN market with two different approaches. Its first approach is to feature a file server using a 68000 microprocessor that does the actual job of maintaining the disk directory files. This approach eliminates the problems encountered when individual operating systems address the disk directly. This true approach, with a file server, does allow dissimilar systems to share data files. The use of the 68000 makes operations fast and efficient. A system set up for six users with a 20-mega-

byte drive costs about \$14,000.

As an alternative, Novell is introducing a system using an IBM PC-XT as the file server. This file server will not move data as quickly as the 68000-based system, but the system costs about half as much.

According to Craig Burton, the product marketing manager for ShareNet, Novell's goal is to provide for complete data transportability between common microcomputer systems. It presently has software available to support a mix of IBM PC and Victor 9000 systems. Novell expects to have finished software available for other common MS-DOS and CPM machines in the next few months.

The Future of LANs

The path of growth for microcomputer local area networks in the short term is clear. We will see more functional software being integrated into the networks to do things like electronic mail, office automation, and executive support. Tecmar is moving to combine a lower level Ethernet protocol with higher level functional software. (See "ComNet for the PC" in this issue.) We will also see more systems with the ability to share data files between dissimilar users.

Companies such as Corvus and Nestar will continue to improve the capabilities of their systems to communicate with external networks, such as IBM's SNA and the international X.25 protocol.

The big question is, however, what will IBM do? IBM has the power to drive the industry and to force many of the present vendors to adapt or die.

The present market contains some mature and capable networking tools, but if you don't see a network you feel you can grow with, then carry floppy disks

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the power to force many
of the present vendors to
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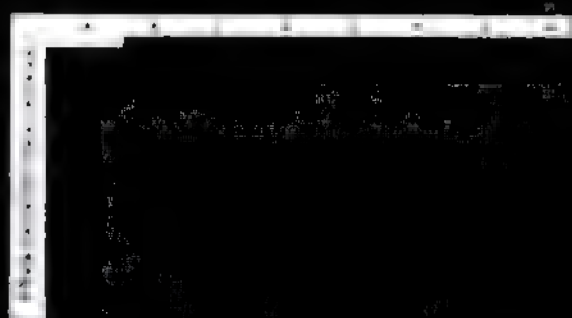
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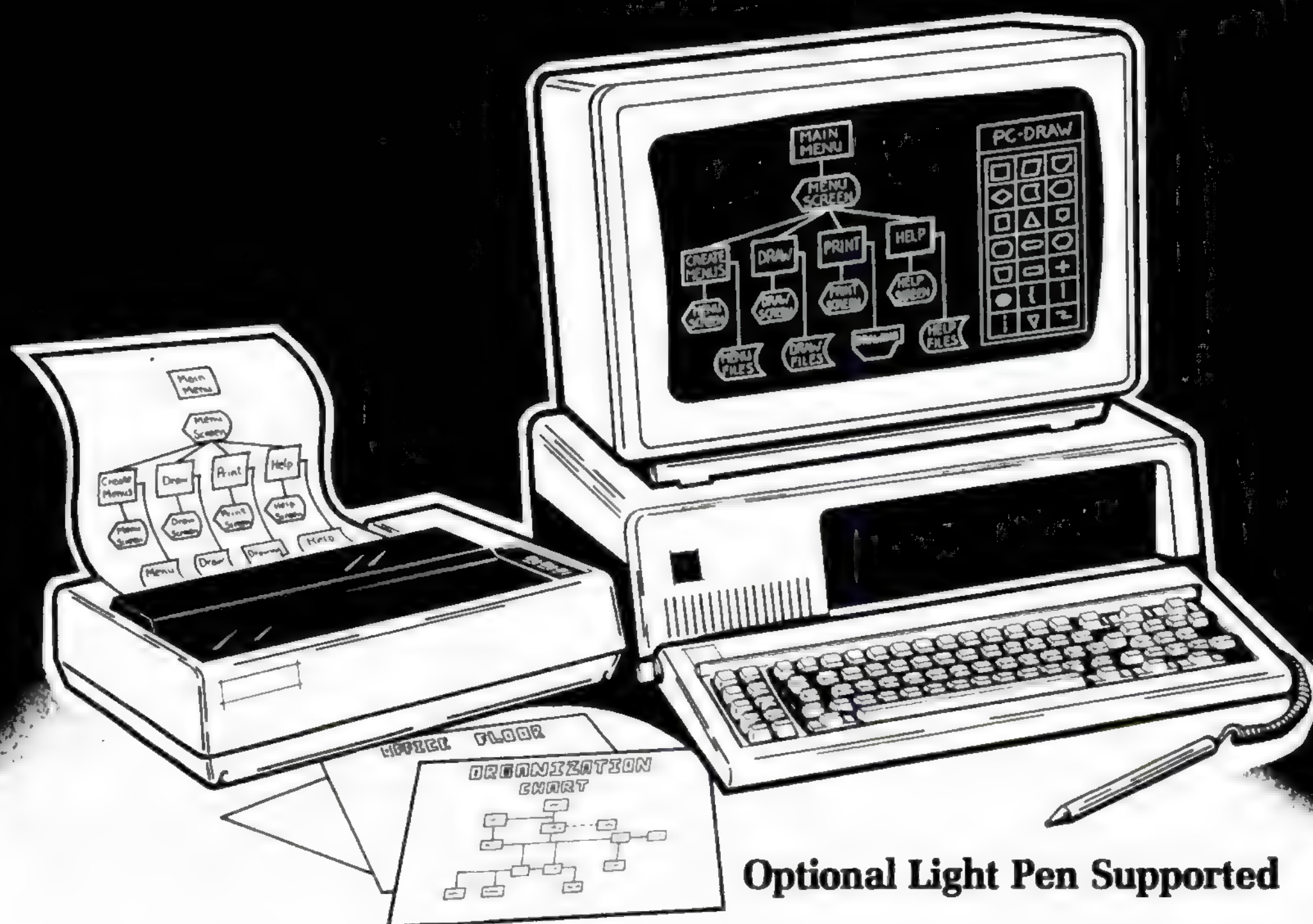
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Buy the software first.

Since the reason you're buying a computer is to get the capability the software gives you (remember it's the software that tells the computer what to do), it makes good sense to pick the software first.

Start by making a list of the things you want the computer to do. Possibilities include word processing, inventory control, accounting, graphics, recordkeeping—you name it, there's probably software that does it.

Next take your list into a computer store and ask the salesperson to demonstrate software that will do the things you want.

Even though you'll need a computer for the demonstration, keep in mind the computer is just a vehicle. The software is the driver. Once you've decided on software, picking the rest of the computer system will be that much easier.

The simpler the better.

Some people will tell you that software has to be complicated to be powerful. Nothing could be further from the truth.

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Ask any industry soothsayer to say his sooth and he'll likely explain that the future of personal computing lies in networking. His prognostication should be no surprise. In today's fast changing world of personal computers, it seems that if you turn your back for an instant, another network will crystallize from silicon, ready to catch your computer in its web.

Given the lush profusion of local area networks (LANs), the arrival of any new system may seem worthy of nothing more than the fanfare normally accorded to the sprouting of another dandelion. To stand out amid the ever-growing numbers of LANs, a new networking scheme has to be something really different.

ComNet is. Certainly it shares the basic precept of networking—linking computers together. But its prefix is the most important part of its name. You might expect Com to stand for Computer. Actually, it's a diminutive of *Communications*.

The extent of its communication abilities is the key to the difference between ComNet and other personal computer networks. Instead of offering just another

method of connecting two or three IBM PCs to each other, ComNet's creator, Tecmar, has taken the essence of networking—letting computers and their accessories talk freely to one another—and expanded on it. ComNet pushes the endpoints of the computer network out further than ever before, to include not only PCs but their operators. And it stretches the reach of a system from stations within a single building to a network that connects continents.

Many of the capabilities designed into ComNet hint at what can be expected when all the personal computers in the world finally wise up and band together. Yet as advanced as it may seem and as much a part of the future as it is, when the ComNet system is dissected there's noth-



The first board ComNet made in developing the system (left), and the slimmed down final version (right).

ing really new. Rather it's an imaginative packaging of existing technologies into a single system. The future it points to is a synthesis of many divergent branches of personal computing, including networks (Ethernet), a modem, voice and video communication, recording and recognition, and even a mouse. With ComNet, all of these concepts and technologies fit inside an otherwise ordinary IBM PC chassis, held together by a glue called software.

The Promise of ComNet

As you might expect, much of ComNet works like any other local area network. Files can be sent from any computer in the network to any other machine. Information can be drawn from a central data bank. Any computer or work station in the system draws its thoughts on a single (probably expensive) plotter or high-speed printer. Passwords protect sensitive files from prying eyes. The ability to keep all data storage in one locked room allows a computer system with the tightest security specifications.

But the network capabilities of ComNet don't stop with computer data. Voice digitization turns spoken words into a digital equivalent that can be handled by a PC as if it were a data file. As digital pulses, a voice can be sent over the same cable that the computer uses for data transfer, and can be stored in the same disk memory system with other files. In fact, voice input and data can be mixed freely, so you can prepare a document along with an oral explanation—and store both together. No need to wonder later why you wrote each paragraph as you did.

More than that, you can mail a document electronically, complete with play-by-play or clause-by-clause explanations, anywhere in the network or anywhere a telephone signal can reach—which means anywhere in the world. The built-in ComNet modem transfers anything on the network line to a bigger network, the worldwide telephone system. With the telephone connection, your PC can do double, triple, or quadruple duty as a telephone answering machine, automatic dialer, and a dial digit monitor to give a printout of all the calls you or your PC have made. You can use a Touch Tone keypad on any telephone as a remote control to operate your PC and whatever is connected to it—even your entire busi-

ness—from a thousand miles away. Additional features allow you to speak commands to your computer, move the on-screen cursor with a mouse, or control a dictation machine with a foot pedal.

Yet all ComNet functions are programmed into your PC as background tasks. While you're slaving away at 1-2-3 solving business problems, your computer can be chatting with your former bookkeeper at his estate in Brazil.

ComNet is sold in three versions: the Secretary, the Manager, and the Execu-

***T**HE SOFTWARE acts as a combination conductor and traffic cop.*

tive, each with successively greater capabilities. All three consist of several expansion boards that plug directly into the IBM PC expansion slots and the necessary software to make the hardware useful.

Tecmar advises at least 256K RAM to use ComNet effectively. This amount actually allows at least 110K RAM to be free at all times, which, according to senior software engineer Erich Ringewald, is the greatest amount of RAM used by any program he's encountered.

You'll want to have at least one hard disk drive, for reasons that will become apparent later. Floppy drives are unnecessary, according to Tecmar. The software is designed so that the system can boot without a floppy. However, no one explained to me how you get programs in and out of the system without a floppy disk drive!

A system requires at least two and probably dozens of PCs to take full advantage of all of ComNet's capabilities. Although ComNet is based on Ethernet hardware, the ComNet system may not be directly compatible with existing Ethernet systems. Full implementation of all the ComNet features requires installation of ComNet in every PC in the network. Each of the different ComNet versions consists of a combination of expansion boards and their accompanying software that determine the ComNet features of each individual PC in the system.

The Ethernet Board

No computer is an island—or at least no computer should be an island. This simple concept underlies the philosophy of networking. Put simply, networking means linking together several devices electronically so that they can all share the same information. The electronic gear need not be computers; it can include mere data terminals, printers, and mass storage devices. The shared information can be anything in the digital form that is readily digestible by the equipment. Files can be sent from terminal to terminal, many terminals can access the same database, or several computers can share the same printer.

The essence of networking is that the whole is greater than the sum of its parts. A network can save in hardware costs when expensive peripherals are shared between computers; it can save time when large blocks of fast mass storage are continuously on-line, and on which data from a number of machines can be compiled instantly; and it obviates the necessity of storing the same information in every computer in a business.

Networking combines hardware with the software that links everything together. The hardware is more than just connection wires. It's also the circuitry that converts the computer's internal signals into a form that can be translated. The software controls the hardware and acts as a combination conductor and traffic cop to make sure that everything gets to the right place and that there are no arguments between the connected units.

Tecmar adopted the Ethernet hardware standard as the basis for its ComNet system. Rather than try to create a new standard, Tecmar chose to use an industry standard. Ethernet is primarily championed by respected names like Xerox, Digital Equipment Corporation (DEC), and Intel. Of course, on the practical side, it's also a lot cheaper to use an existing system than to invest millions in developing a new one.

Despite the fact that Ethernet tends to be the most expensive of the currently-used standard networks to implement, Tecmar chose it from among other recognized standards (essentially Arcnet and Omninet) because of its high-speed capabilities. Ethernet operates at 10 megahertz (MHz, or millions of bits of data per second) compared to Arcnet's 2.5 MHz. and

Omninet's roughly 1 MHz. What's more, as Ethernet gains popularity, its cost should fall, particularly since most of the system is now contained on a single silicon chip.

High speed seems like a good idea until you realize that the IBM PC doesn't think at anywhere near the speed of Ethernet. "Send an IBM PC a 10 MHz. Ethernet burst, and it will sit there all day trying to figure it out," noted Ringewald. In truth, the higher speed of Ethernet won't make much of a difference when a few PCs are knotted together. In an Ethernet system the computers themselves are the slowest part of the system. Using floppy disk drives further slows the PC, one reason that Tecmar recommends that floppies not be used in a ComNet system.

When a network expands, however, speed becomes important because all the computers and all the peripherals must communicate over one wire, and the network rules (and common sense) prohibit more than one device from communicating at a time. Because Ethernet (and hence ComNet) is designed to handle up to 1024 separate computers and peripherals—"nodes"—speed is very important.

Each Ethernet or ComNet system uses a coaxial cable to carry the conversations between nodes. In connecting the system, this special cable must be run to every computer in the system. Regular telephone cable will not work at Ethernet speeds.

IN AN ETHERNET system the computers themselves are the slowest part of the system.

The Ethernet Companion Board

The voice communications capabilities of the ComNet system depend on Tecmar's Ethernet Companion Board. Its most important function is voice digitization: changing analog voice signals (the type of signals used in stereo equipment) generated by a microphone into digital signals that can be handled by both a PC and the

Ethernet system. The digital processed voice information can then be manipulated as a standard PC-DOS (or MS-DOS) data file.

Technically, the board uses delta modulation at a 32 kilobit per second sampling rate. To the user unversed in jargon, this means that the sound quality of a recorded voice should be about as good as what you hear over the telephone.

I was told that the Tecmar design goal is a bandwidth of from 300 to 4000 Hertz, slightly wider than that provided by normal telephone service, and a signal-to-noise ratio of 30 decibels (dB). During a demonstration at the Tecmar office, I spoke to the digitizer and it echoed my voice, preserving all inflections, sounding more like a mediocre tape recorder than a computerized voice. My estimate of its record/playback signal-to-noise ratio was 20 dB. The engineers at Tecmar acknowledged my figure as about what they had actually measured, but they countered by saying that production models would be "cleaner" and sound better. Even without the cleanup, I would label the quality as tolerably intelligible and acceptable for most business purposes.

Delta modulation means only that the changes in sound from one sampling period to another are recorded, saving circuitry and the amount of storage space needed. Saving space is important because the digital translations of voice use up a lot of room. A little math is revealing: 32 kilobits per second means that storing one second of digitized voice takes eight kilobytes of memory. In other words, a single-sided floppy will hold roughly 45 seconds of gab, hardly enough to turn your PC into a dictating machine. You now know another reason why Tecmar does not recommend using floppies with ComNet. No doubt even a small hard disk, like the IBM Personal Computer XT's standard 10 Megabyte, has more than enough room for comments on contracts and the like. Even so, a little talk can take big bites out of the Winchester.

For dictation, and other lengthy message recording, however, the Ethernet Companion Board also provides a micro-cassette recorder controller for a Pearl-corder SX-02. Explained Ringewald, "It's the only one we've found on the market with remote control capabilities and good sound quality."

To help with dictation, the Ethernet

Companion Board also provides a foot pedal that, typically, can be used to control the Pearl-corder. When used in the ComNet system, a foot pedal allows for some interesting programming possibili-

A SINGLE-SIDED floppy will hold roughly 45 seconds of gab.

ties. Because the PC can detect the silence between words, the cassette recorder can be programmed to play ten or any convenient number of words then stop, so that a secretary taking the dictation can catch up. A tap at the pedal brings another ten words. Or the pedal can be programmed to act as a "dead man's pedal"—the recorder will run only while the pedal is pressed.

The Ethernet Companion Board comes equipped with the circuitry to control a mouse so that there's no need to stuff another board into the PC when new software requires the addition of a mouse to the system. A mouse will not, however, be part of the initial ComNet offering, according to Tecmar president Martin A. Alpert.

Modem Board

To extend the reach of ComNet from within a single facility to the outside world, a modem on a plug-in expansion board is optionally supplied (standard in the ComNet Manager and Executive systems). Both 300 baud (Bell 103) and 300/1200 baud (Bell 212A) modem cards are available.

The modem cards can perform all the functions of a typical external modem—and then some. The modem allows the PC to send and receive data through standard telephone circuits from anywhere in the world. (Yes, if you wanted to, you could send digitized voice files through the modem, but because of the digital conversion, you'd actually get about a tenth less throughput than by just talking.) The modem will automatically answer the phone if you want it to, and can even decode DTMF (dual tone, multiple frequency signals, also known as Touch-Tone) so that you can use a telephone keypad to access

information in your computer or to control its functions.

Combining the modem and voice digitizing features, you can turn your PC into the world's most advanced telephone answering machine. Not only will it play and record messages, it can play different messages at different times, and can play special messages to particular people. Typically they would use their own telephone keypads to access their personal messages.

The modem board, and hence, your PC, is connected between your telephone and its jack. You plug the PC into the jack and your telephone into the PC. In case of a power failure, or when you turn your PC off, a failsafe relay on the modem directly connects the telephone to its jack so that your telephone will function normally. Although a separate microphone and speaker can be used with the ComNet system, the telephone handset can provide both functions.

Voice Recognition Board

The Executive ComNet system differs from its lesser siblings in that it includes a Voice Recognition Board that enables your PC to hear and react to what you say. The Tecmar version of voice recognition has a standard vocabulary capacity of 100 words, which can optionally be increased to 200 by adding more RAM chips.

The board has no standard or built-in vocabulary; rather, you train the system to recognize any words you want as single keystrokes, combinations of them, or as complete commands. Although recognizing numbers by their English names presents no problems to the system, the letters of the alphabet sound so much alike that your ComNet-equipped PC might think them indistinguishable. Should you need to spell things out for your computer, however, you can teach it to understand an unambiguous alphabet such as the one used by pilots and old-time radiomen:—"alpha," "bravo," "charlie," and so on. The engineers at Tecmar recommend teaching your computer to understand the basic PC-DOS commands, like Return, Directory, Type, and Chkdsk.

Note that the Tecmar voice recognition system is not "speaker independent." It will recognize your voice and probably that of no one else. If it is "trained" using a high quality microphone, it may not rec-

ognize your voice over the telephone.

Training is a simple procedure. You tell your computer what you want the spoken instructions to mean by typing the instructions in. The monitor screen then prompts you to say one word after another into a microphone so that the computer can learn what your voice sounds like for

***IF YOU'VE
trained your PC to
recognize your voice
over the telephone, you
can command it from
anywhere in the world
by voice command.***

each word. For best results, the training list should be repeated five or six times.

When you are finished, the results are amazing. The microphone becomes an extension of the keyboard (a "transparent keyboard," one company calls it), and it elicits the proper commands no matter what program you are running. Every time you say "return," for instance, the computer registers a carriage return as if the Return key had been struck.

Voice recognition is not just for the chronically lazy or those too temperamental to type. In most cases, this technology will supplement rather than eliminate normal keyboard entry. It can help those who cannot use a keyboard (for instance, the handicapped) or those who cannot get to a keyboard.

If you've trained your PC to recognize your voice over the telephone, you can command it from anywhere in the world by voice command.

Networking Video

Besides digitized voice, ComNet can handle digitized video from Tecmar's monochrome Video Van Gogh expansion board, which translates the image from a television camera into a digital picture with a resolution of 256 by 256 pixels and 256 levels of gray. The result is not a moving-image television picture. The IBM PC and Video Van Gogh combination is not a

particularly speedy video digitizer. Recording a single frame snapshot requires about 6 seconds.

The resulting picture is handled by both computer and ComNet as regular data; it can be reproduced (in 16 levels of gray, although all 256 levels are stored) on any monitor that uses an appropriate graphics interface board in the ComNet system. Even at Ethernet's high 10 MHz. speed, transmitting a complete picture within the system still takes about one second. A digitized picture can also be sent—albeit very, very slowly—over a standard telephone line using the ComNet modem.

Snapshot video does have its uses. It can identify parts on an assembly line or signatures on documents. With proper software, it can become a security system, detecting any change in a patrolled area and immediately notifying the proper authorities, using ComNet, of course.

Using the System

Networking and ComNet are definitely not for everyone. The high speed advantages of Ethernet don't become apparent until numerous PCs share the same network. The exact number depends on how heavily the network is used. Systems from three or four to 200 work stations are practical, according to Tecmar engineers. Other networking systems exist, though none have all the extra features of ComNet. Even the high speed of Ethernet can be bought by itself elsewhere—from 3Com, for one—cheaper.

The only shortcoming in the ComNet system seems to be that its capabilities are growing faster than available memory. Voice and video digitization both swallow huge chunks of memory. Little wonder Tecmar is readying larger and larger Winchester.

Otherwise it is difficult to fault the ComNet system. The demonstrations of prototypes I saw all work as advertised. And the company promises that ComNet can only get better. In-use tests began in June, and improvements (or corrections) uncovered will be incorporated in the commercial units starting in August. In fact, Tecmar promises to supply at no charge (until next year) any updates developed after ComNet systems are delivered. Later updates will be available to users of installed systems under a software service contract.

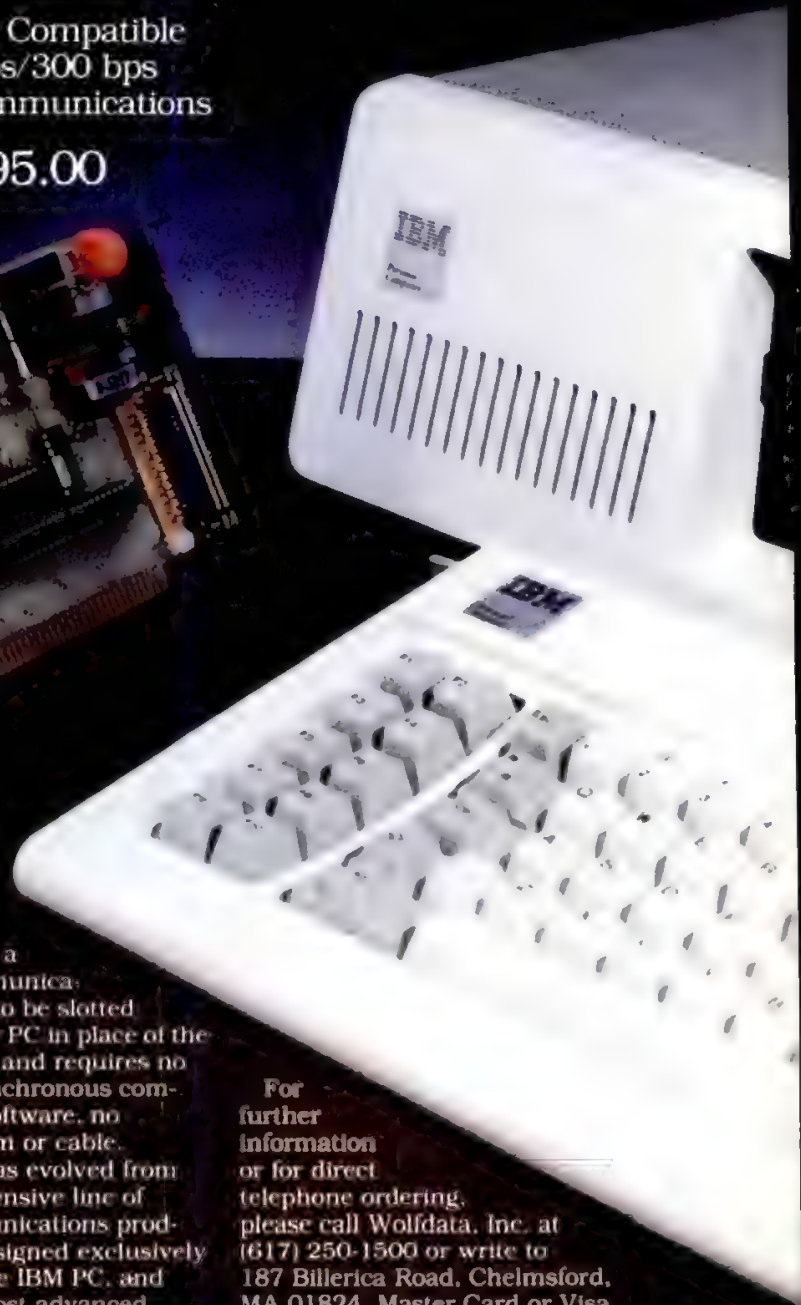
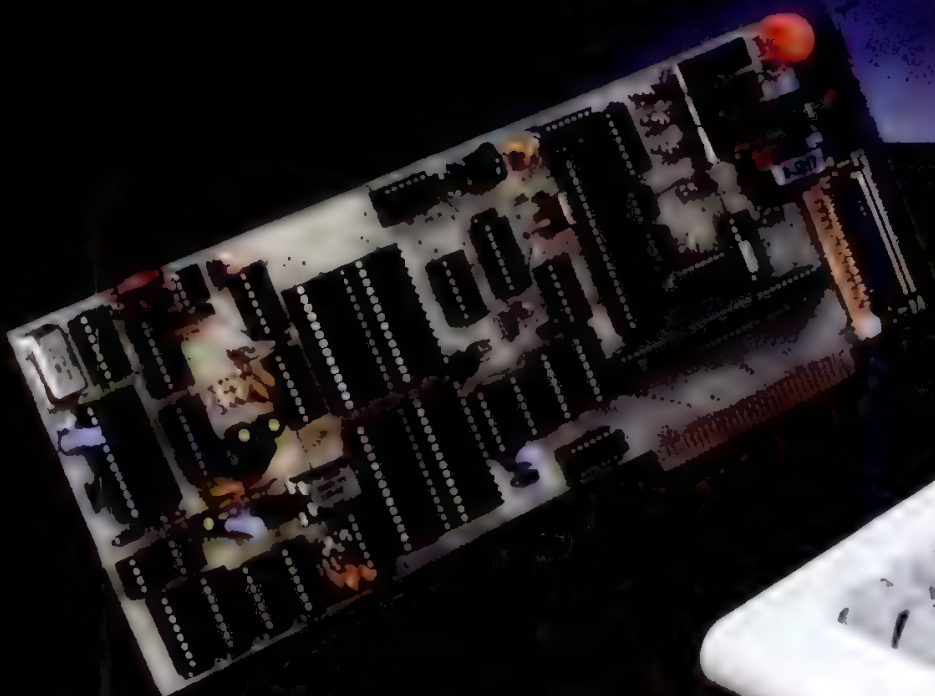
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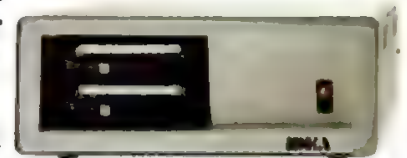
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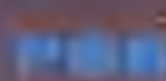
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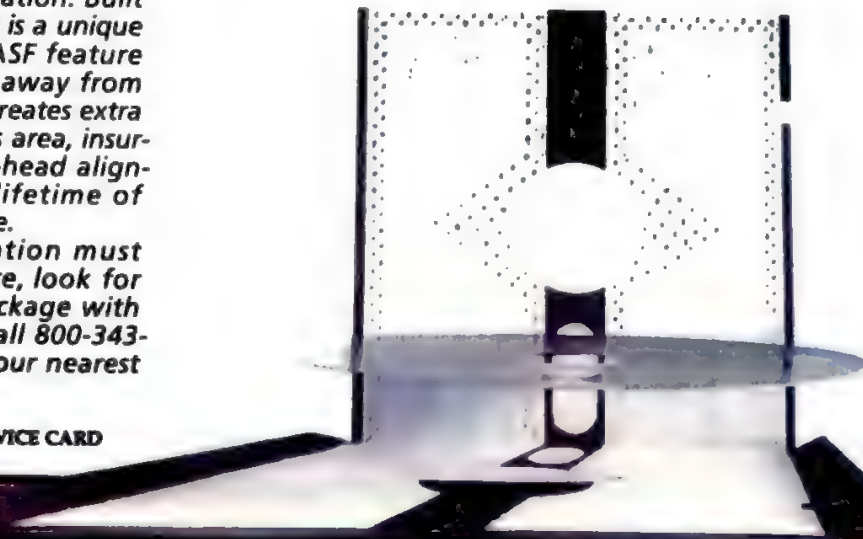
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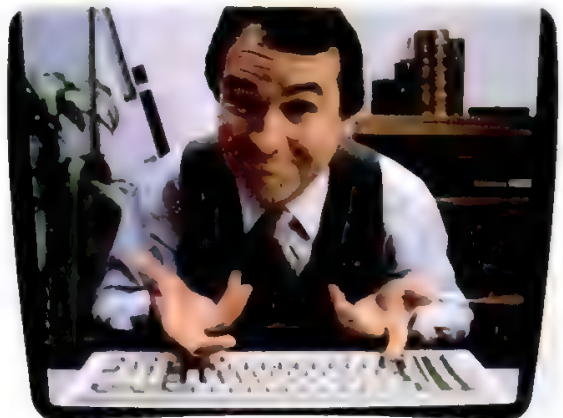
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This book explains the equipment, techniques, and standards that are involved in linking personal computers into a local area network. The following excerpts are from chapters 4 and 6.

Local Networks: A Guide For The Perplexed

A Manager's Guide to Local Networks
Frank J. Derfler, Jr. and William Stallings; Prentice-Hall, Inc., Englewood Cliffs, NJ 07632; 153 pages, \$14.95 softbound; ISBN 0-13-549758-2
Copyright 1983 by Prentice-Hall, Inc.

CIRCLE 677 ON READER SERVICE CARD

Connections and Standards

If you are going to make sense out of the various local networking plans, you need to know something about how they hook together and what the strengths and weaknesses of their connection schemes are. In this chapter, we will examine several methods of connecting stations together on a local network.

Media

When local network people talk about

the media, they don't mean the newspapers and television. Instead they mean the various kinds of transmission media that

THE MEDIA
*should be as reliable,
easy to install, easy to
maintain, and easy to
reconfigure as possible.*

are used to hook together the equipment connected on a local network. The most commonly used media are coaxial cable, twisted-wire pairs, and fiber-optic light-

wave pipe.

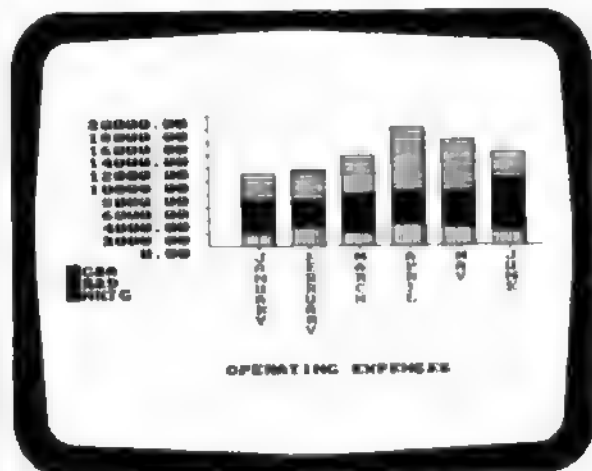
The media used to connect a local network should be as reliable, easy to install, easy to maintain, and easy to reconfigure as possible. In the long run, these considerations might outweigh such factors as somewhat higher initial costs for materials or maximum-transmission-speed characteristics. The disruptions caused by reinstallation, update, and repair of some media are very good arguments for doing things right the first time.

Most networks currently in use transmit messages over either coaxial cable or twisted pairs of wires. Fiber-optic systems capable of performing very well in specific applications are being offered by several manufacturers.

Twisted Pairs

A twisted pair of copper wires is the

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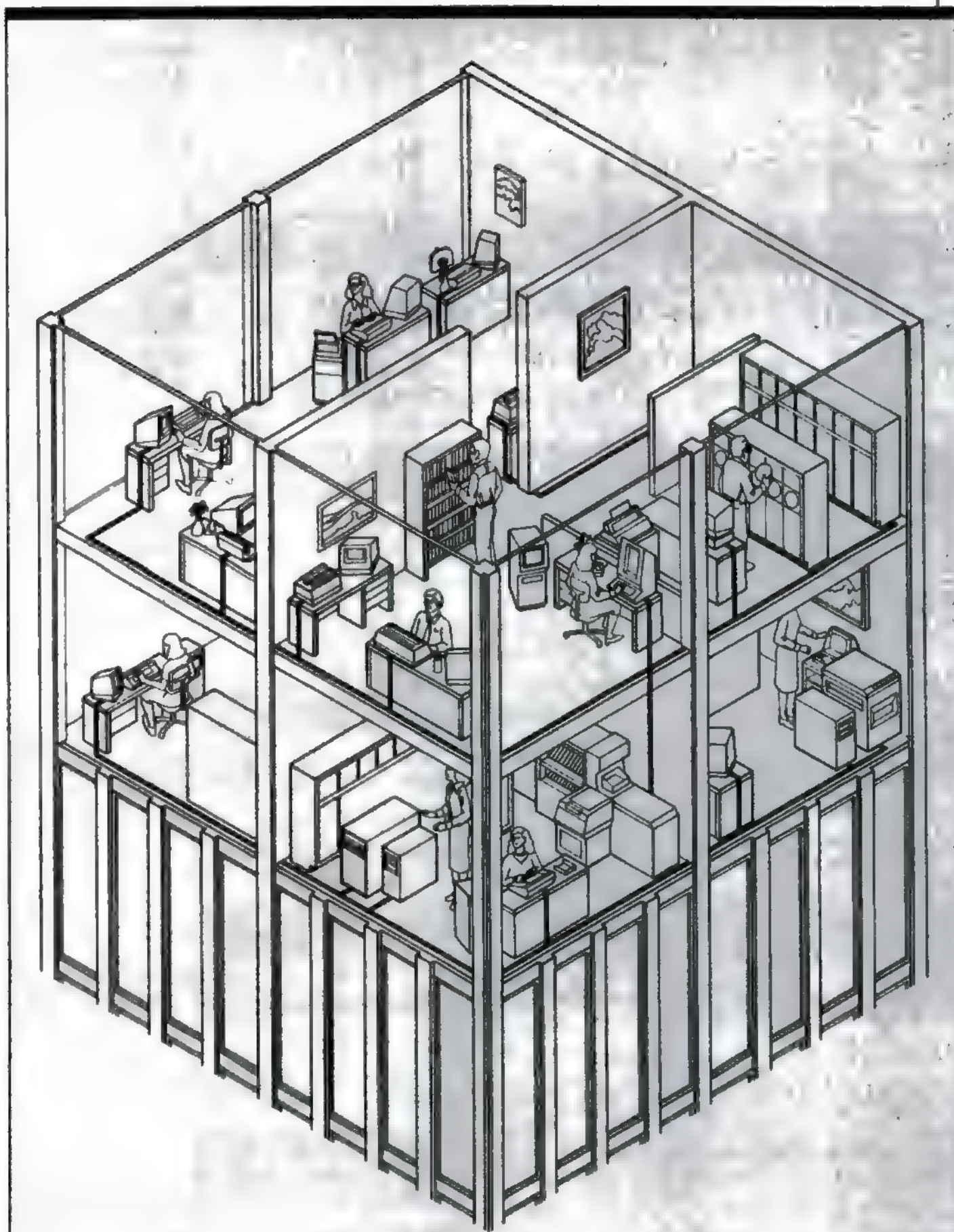
Required hardware: IBM PC with 128 K RAM (DOS 1.1) or with 192K RAM (DOS 2.00) and at least one 5-1/4" diskette drive. For screen graphics: IBM Color/Graphics Adapter and compatible color or monochrome display. For printer graphics: IBM or Epson printer with GRAFTRAX option and IBM Color/Graphics Adapter. **Required software:** IBM DOS, Versions 1.1 or 2.00; VisiCorp VisiCalc, Extended Memory ("256K") Version, or IBM VisiCalc, Version 1.10. **StretchCalc** is a trademark of Multisoft Corp.; IBM is a trademark of International Business Machines Corporation; VisiCalc is a VisiCorp trademark; GRAFTRAX is a trademark of Epson America, Inc.



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simplest form of connection found in modern networks. It is normally easy to install, move, or add to. The cost depends upon the installation method used. If it can be routed internally to the building structure, like telephone wire, the cost is very low. But if local codes or the physical environment requires the use of conduit, it can become very expensive. The twisted pair has some limitations because signals rapidly lose power as they travel down this kind of connection. It can provide reliable point-to-point communications at

speeds of up to 1 megabit per second over a distance of about 1 kilometer. The signal can be extended further through the use of a repeater, which regenerates the signal and retransmits it, but the cost of the repeaters can offset the original low cost of the wiring if the data are to be sent any appreciable distance. Remember, the distance to be measured is the actual path of the wire, not a straight line between two points. A twisted pair can travel for 15 feet merely going around a standard doorway. Twisted-pair wiring is susceptible to



A bus-type transmission medium can serve many different offices. This cable bus could be either coaxial or fiber-optic. (Diagram courtesy of Xerox Corporation. All rights reserved.)

noise from the environment it passes through. As described earlier, the digital signals are very short in length, and any pulses of electrical noise can result in serious data loss. Twisted pairs should not be routed near heavy-duty electric motors, gasoline engines, welding machines, any other device that sparks, or any device that has a strong electromagnetic field, such as a power transformer or radio transmitter. Twisted-pair connections can be a very valuable low-cost solution for small offices not near industrial operations.

If industrial security is a consideration, twisted-pair wires are a poor choice unless they are enclosed in a protected wire-distribution conduit. Even then, the high-speed signals may actually be radiated by the wires and can be received by sophisticated means some distance from the wires without any physical contact.

Coaxial Cables

The other commonly used form of connection is coaxial cable. "Co-ax" is usually made up of one heavy center conductor surrounded by an insulating layer of plastic or plastic foam. A metallic sheath (either braided copper or solid aluminum) is placed over the plastic. The inner conductor and the sheath then share the same common geometric axis and therefore are coaxial to each other (hence the name). The outer sheath is usually covered with another insulated coating. Co-ax comes in standard sizes with outside diameters of about 1/8-, 1/4-, 3/8-, and 1/2-inches. The size of the co-ax, the type of insulation, and the type of sheath determine how fast and how far signals can travel over the cable.

Different types of coaxial cables are used at various points in a network. Trunk cables are used for long runs between buildings or remote equipment. These are the highest-quality cables, with foam insulation and solid aluminum outer sheaths.

Distribution or feeder cables take signals close to the equipment. These are smaller cables, but probably still have solid sheaths. Drop cables provide the final link to the equipment and between equipment in a local area. Drop cables are the smallest and most flexible.

Co-ax is not cheap. Material costs alone can easily run \$1 per foot. Installation can more than double the price. It

isn't easy to install because (particularly in the larger size) it is fairly stiff and cannot make sharp bends. It is best installed in false flooring or ceilings, where it can be easily fed into position. Coaxial cable does not require conduit for installation and can be buried for runs between buildings.

Coaxial cable has a very wide bandwidth. The theoretical transmission speed for coaxial cable is much higher than for twisted pairs. It can easily carry a 10-Mbps data circuit and several channels of video plus many voice conversations at the same time.

The shield on a coaxial cable gives it

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good resistance to the intrusion of noise. Co-ax is not completely noise-free, but it can provide good service in environments where unshielded wires could not function. It is particularly resistant to electromagnetic interference from sources like radio transmitters.

Coaxial cable provides improved industrial security over twisted-pair wires because it radiates less. It is, however, still easily tapped by anyone who can gain physical access to the cable.

Nothing has helped the popularity of coaxial cable as much as the cable television (CATV) industry. The widespread use of CATV has created a ready supply of cable, parts, and connectors. It has created a pool of persons with knowledge of how cable systems should be installed and maintained. Many buildings are now being wired for CATV during construction, and the executive looking for a local network can often find a very capable high-speed transmission medium already behind

the walls.

Fiber-Optic Cable

Both coaxial cable and twisted pairs of wire require that care be taken to ensure that they avoid contact with inappropriate electrical grounds. They must also be routed around heavy manufacturing locations

A TWISTED pair can travel for 15 feet merely going around a standard doorway.

or other sources of interfering noise. Fiber-optic cables do not have these drawbacks. Since fiber-optic cables are made of glass, they are not troubled by the unequal electrical ground potentials often found in

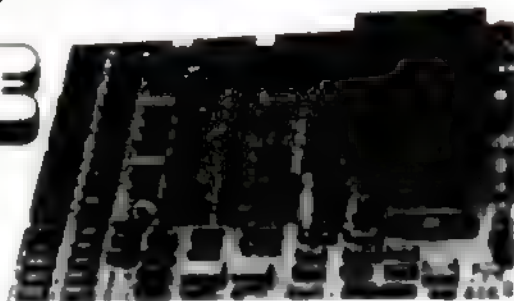
large buildings. Lightning and other induced power surges are also not major considerations. Fiber optics have other advantages over copper wire and cables, including potentially lower costs, freedom from tapping and interception, freedom from radio interference, and the elimination of some forms of degradation that take place when electrical signals travel long distances in a conductor.

The potential transmission speed of fiber-optic cables is even higher than that of coaxial cables. Practical fiber-optic systems that can operate at speeds of 20 Mbps over distances of up to 2 kilometers are on the market. The popularity of coaxial cable with CATV companies has probably slowed the development of fiber-optic systems. But CATV companies are also interested in the technology for their heavy-use, short-run requirements. One of the most ambitious projects is installed in London, Ontario. This 322-Mbps system carries 12 color television channels and 12 stereo channels over 8 kilometers. The system electronics were built by Harris

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Corporation and the ten lengths of six-fiber cable were manufactured by Canstar.

FIBER *optics have freedom from tapping and interception.*

Fiber-optic installations are still seen less frequently than coaxial-cable installations because of a lack of standardization in the industry and a lack of experience among installers and service organizations. Workers know how to hook up copper wire and co-ax, but coupling optical

fibers requires some specialized knowledge. Efficient coupling of the light energy from fiber to fiber and from the fiber cable to the transmitter and receiver requires the use of special connectors and alignment techniques. The lasers and light-emitting diodes used to transmit light down a light pipe are still produced only in small quantities, so their prices are high. Still, fiber-optic technology is rapidly joining with cable and wire systems to deliver information on some other medium than paper.

If you have a very noisy environment, are particularly concerned about security, or have very-high-speed data and video transmission requirements, you should consider fiber-optic cables as an interconnection method. Great potential still exists in the field of fiber optics for development work. Some industries might consider a combination developmental and operational fiber-optic system, which

would have unique long-term investment potential.

Pairs of twisted wires, coaxial cables, and fiber-optic cables all have their own specific strengths and weaknesses. They sort themselves out pretty well, depending upon the size of the installation, speed requirements, and conditions of use. Similarly, the ways in which information systems are hooked together can be pretty easily grouped. But beware of anything that appears to allow easy labeling. The practice is often quite different from the preaching!

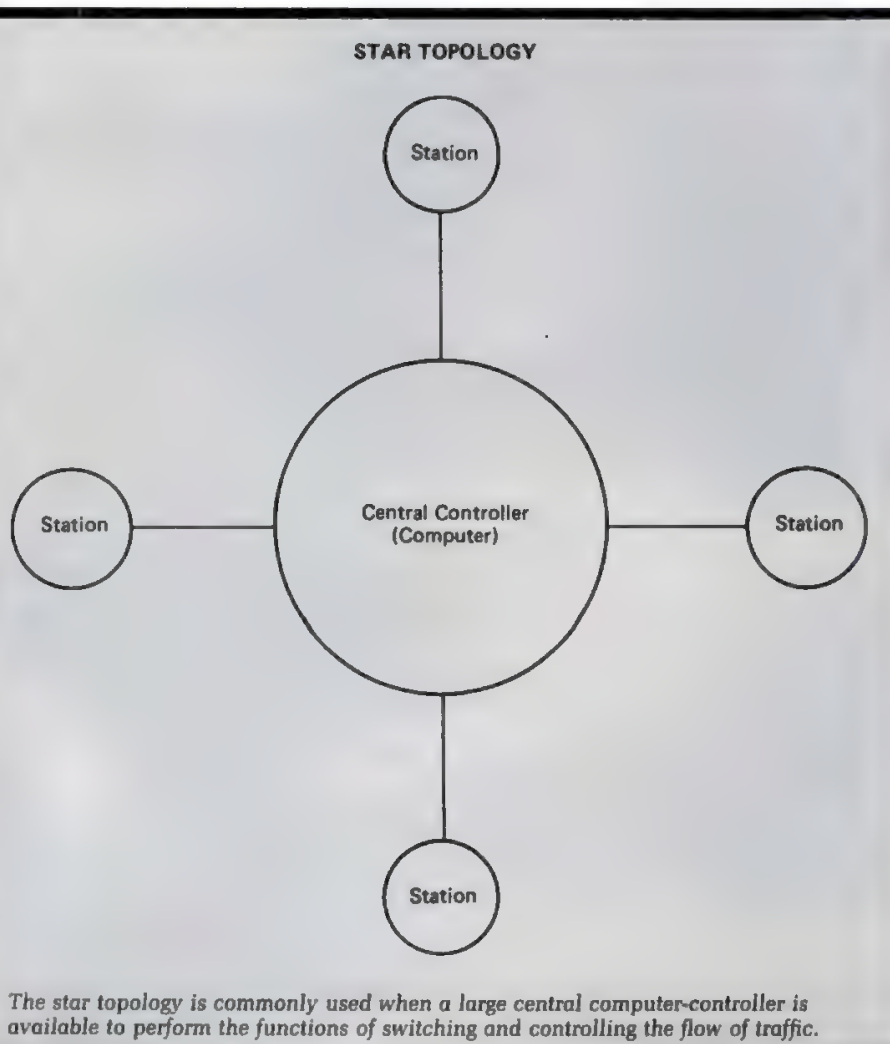
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The Topology

The topology of a system refers to the way units in a network are connected together—the geometry of the system. Stations on a network can be strung out like the stops along a bus route, arranged in a circle like the petals of a flower, or laid out like the points of a star. In fact, those are the three common ways of describing the topology of a system: the star, the ring, and the tree.

The Centralized Star Network

A star network consists of a central controlling device connected by a point-



COUPLING *optical fibers requires some specialized knowledge.*

to-point communications circuit to every other device on the network. This is the configuration commonly used to connect a large mainframe computer to its remote terminals. It also describes the layout of most common PABX systems. This pattern permits good communications between the stations on the network and a centralized host. All communications between individual terminals must pass through the host.

This kind of system is particularly appropriate when the host contains all of the database to be shared or programs to be run. It is, however, a very vulnerable system, because when the host breaks down, all activity stops. A malfunction in the

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centralized host can disrupt communications between users who really have no need of the host's capabilities other than as a communications relay.

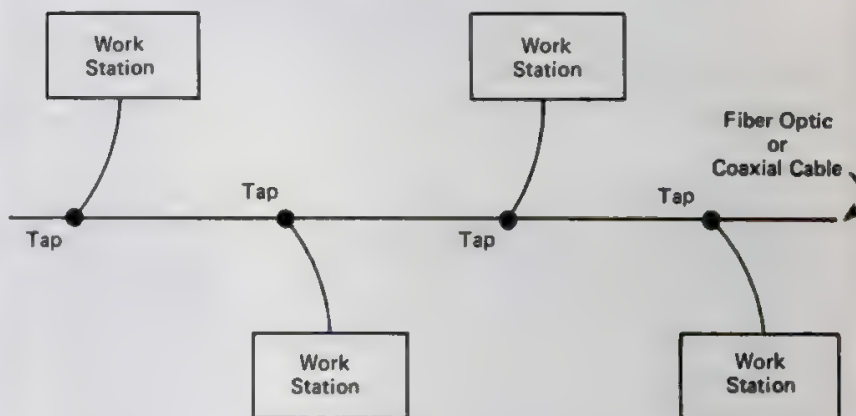
Centralized systems can usually be expanded easily, up to the limit of the central computer's capabilities. The cost to expand beyond that point may be high because it can involve the investment in large hardware packages. Centralized systems can allow easy access into one or more outside communications systems. The central computer can perform all of the functions needed to exchange information with other local or national data networks. Centralized systems can also provide good physical and software secu-

PAIRS OF twisted wires, coaxial cables, and fiber-optic cables all have specific strengths and weaknesses.

rity. The central system can be monitored by a human operator who can screen the terminal users desiring access to certain information.

If all of the devices on the system frequently have to exchange a variety of data among themselves, the star can become cumbersome. The centralized computer becomes simply a message switch. It is probably not economical to operate and maintain a large centralized system just to serve as a message switch. In the star network each communications link is exclusively dedicated to the two devices it connects. When these devices are not communicating, the expensive communications link is idle. Even when the units are communicating, their data rates may be considerably less than the capacity of the link, particularly if one unit is a terminal and the other a computer. The throughput of a terminal to a computer is probably less than the typing speed of an average typist. It makes little sense to shoot these characters out at a speed of 1200 baud or more when the total throughput is only 60 or 70 characters per minute in one direction.

TREE TOPOLOGY



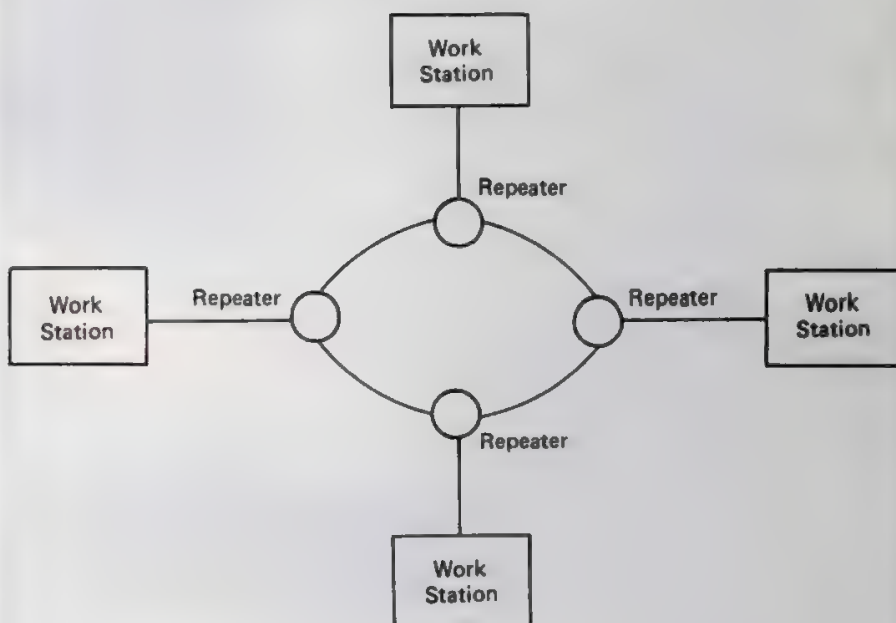
The tree topology hangs stations from a common cable bus like leaves from the limb of a tree. Failure of a cable tap will not normally inhibit the operation of the entire system.

The Ring Network

The ring, loop, or daisy-chain topology arranges the stations of a network in a circle. One station on the network can be designated as a master to control the timing and transmissions of all the other units, or the units can have some sort of built-in

operational program that allows them to enter into the system at idle times. In a ring network, a message may be relayed by some stations on the network. All stations monitor all messages to see if any are addressed to them. The ring network has greater equipment reliability, since it does

RING TOPOLOGY



The ring topology depends on active repeaters to relay information around the ring. Any of these repeaters could be a weak link in the system. Despite this, the ring topology has gained acceptance with network developers in Europe. It is becoming more widely accepted in the United States.

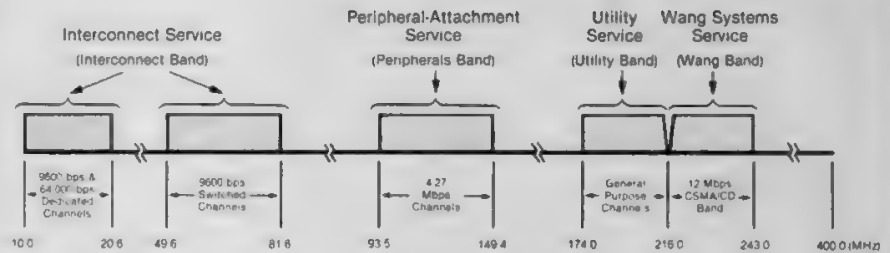
not require a central controller or relay point. However, failure of one relay point in the ring may (depending upon the transmission arrangement used) halt the

EXPANSION of a ring network may involve software or hardware changes in every station.

complete message transmission process.

Expansion of a ring network may be complex. It may involve some software or hardware changes in every station. Security in a ring network depends to a large degree on the physical security of the stations themselves.

Ring networks do not lend themselves well to the combination of different kinds of information (video, voice, and data) on the same system.



This illustrates the manner in which frequencies are allocated on the WangNet broadband local network. This broadband system has so much capacity that significant portions of the spectrum are not even allocated. (Diagram courtesy of Wang Laboratories, Inc.)

The Tree or Bus Network

A very common form of interconnection is the bus arrangement. On a bus network the stations are attached to a single (or perhaps dual) coaxial or fiber-optic cable. The stations are attached by devices called cable taps. The bus system shares several advantages with the ring: (1) It does not require a centralized controller, (2) it does not allow sections of connecting

medium to go idle, and (3) it can economically handle short messages exchanged among many different stations. The bus connection scheme has the added advantage of being able to operate effectively if one or more stations malfunction. Bus systems can be easily expanded and modified to exchange data with other networks. The security of a bus system is dependent to a large degree on the physical security of the stations on the system.

Bus systems easily lend themselves to the combination of video, data, and voice information on the same system.

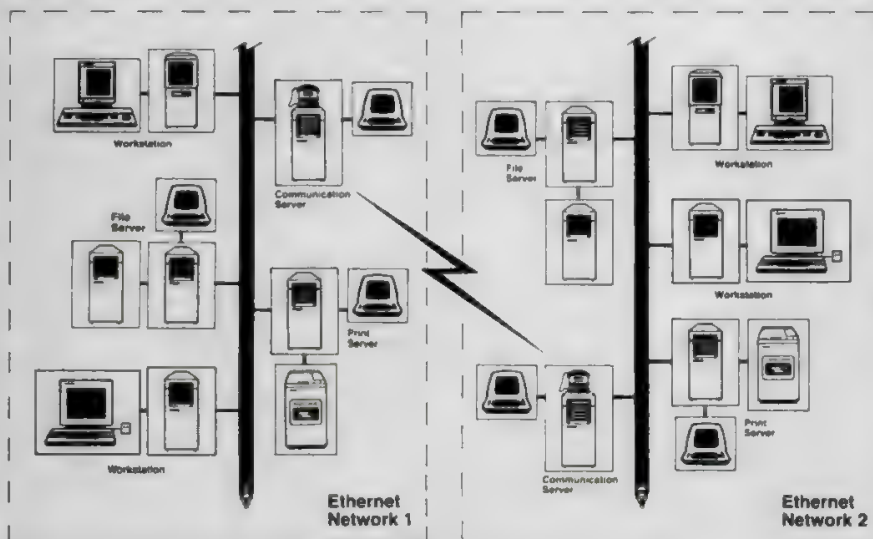
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IN A RING
network, all stations
monitor all messages
to see if any are
addressed to them.

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This shows a few of the kinds of devices that could be attached to the Ethernet coaxial bus system using a tree topology. (Illustration courtesy of Xerox Corporation. All rights reserved.)

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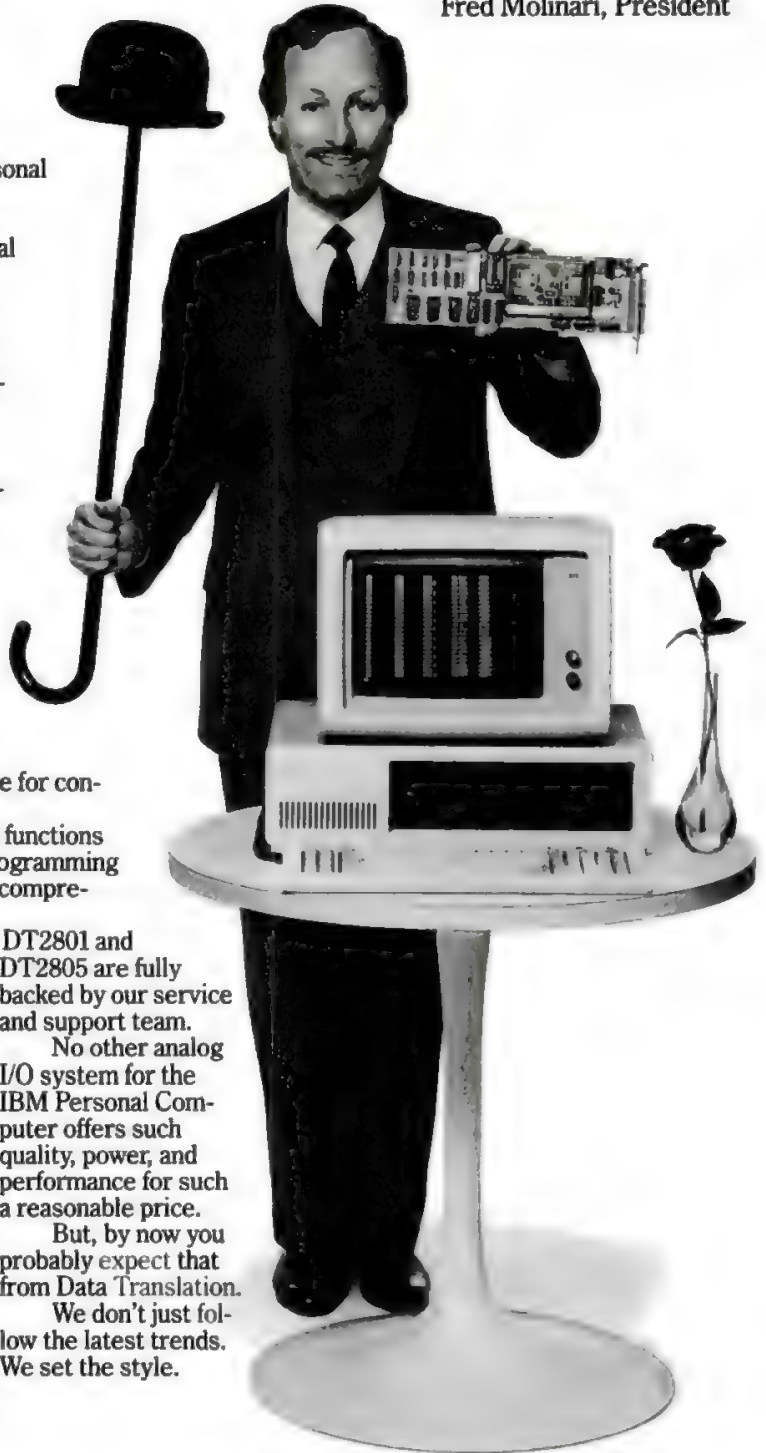
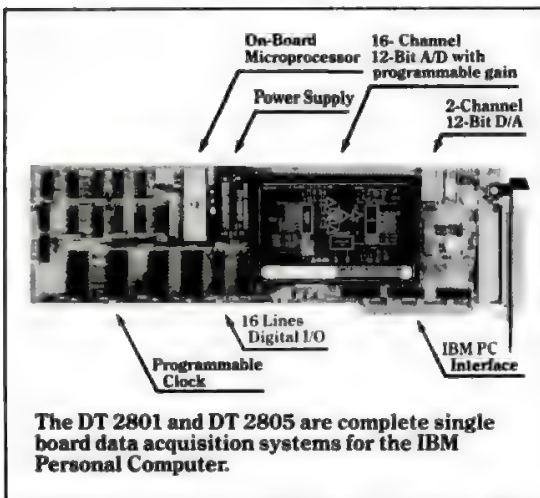
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mation have rules governing how they transmit and receive data. These rules allow multiple users to have access to the information network medium.

Traffic or highways can be divided according to either time or space. Stoplights regulate traffic according to time. Complex switching systems can control several lanes of traffic. Lane markers divide traffic according to space. In some cases lanes are firmly established and in others they are more flexible. Similarly, the traffic on an information-movement system can be divided according to time and the electrical equivalent of space: frequency.

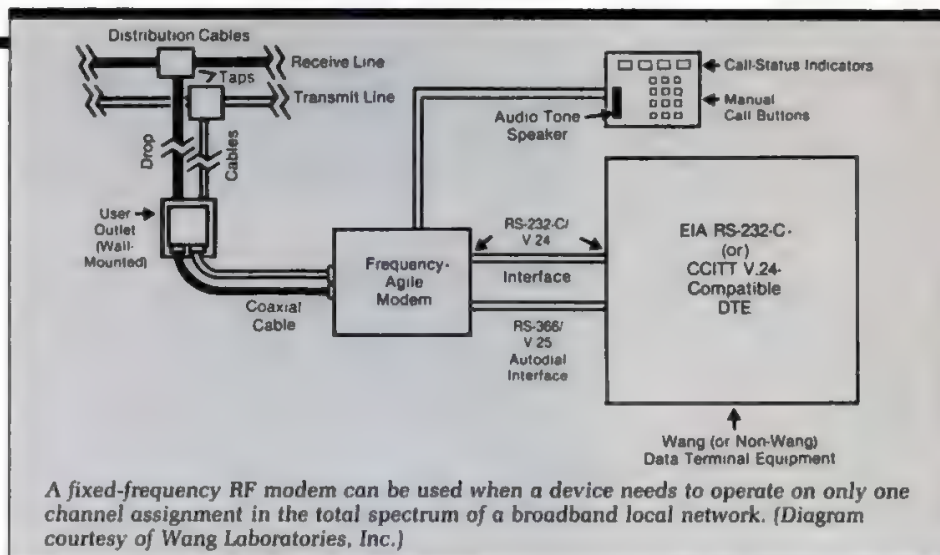
Time Sharing

There are several ways in which network stations can share the time available on a system. These include polling, reservation, and contention schemes. Methods of allowing many stations to share the

CONTENTION

schemes operate like automobiles at a four-way stop.

same communications network by regulating the time slots in which they can transmit are called *time-division multiple-access (TDMA) techniques*.



Master-Controlled Methods

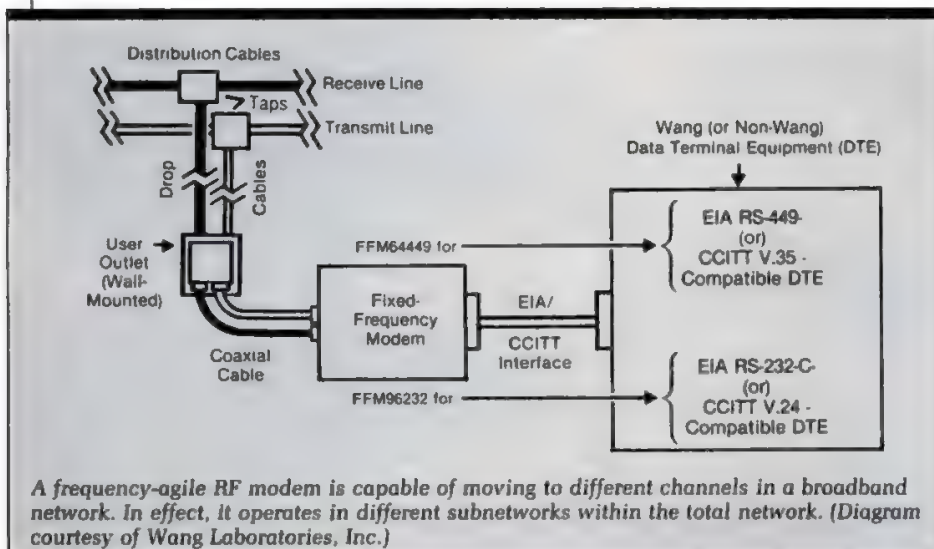
Polling is a method of operation found in systems with a master network controller. These are normally large computers operating in the star configuration. A polling scheme operates like a good waiter in a restaurant. The server (and the expression "communications server" is actually used in the industry) constantly glances at the customers to see if any need service. When they signal their desires, the server provides a channel of communications. In the meantime, the system keeps busy with housekeeping duties and the needs of the more demanding customers.

Reservation schemes operate, as you might assume, according to a preset schedule. The scheduled transmission time for each station on the network might occur many times a second. If the channel is busy when a station's reservation comes

up, the station on the channel will retain priority. Various arrangements prevent stations from making exclusive use of the channel. Reservation schemes usually use a master controller, but this is not an absolute requirement if all stations know exactly what time it is and what the reservation schedule is.

Waiting for the Bus

A method of multiple access known as *contention* is the most widely used on bus-configured networks. Contention schemes operate like automobiles at a four-way stop. The driver arriving at the intersection first proceeds first. If two drivers arrive at exactly the same time, they try and bluff each other out to see who will get across first (they don't know about the rule of yielding right-of-way to the right on the data bus). If both cars start at the same time, they will usually back off until one delays long enough for the other to get through.



RULES

allow multiple users to have access to the information network medium.

We use four-way stop signs at intersections because they are cheaper than stoplights and other forms of controlled access and because they provide an even flow of

traffic even if it arrives at the intersection at irregular intervals and in irregular clumps. Stoplights divide the time between roads, but all roads might not have the same amount of traffic. A smart traffic cop could respond to the changing traffic conditions but would be an expensive waste of resources during idle times.

Similarly, the contention scheme has the advantage of being relatively simple yet able to respond to changing traffic patterns on a system. Most bus networks use a contention scheme called *carrier-sense multiple access with collision detection*

(CSMA/CD). Two simple rules of courtesy are used by stations operating on a CSMA/CD contention network: (1) Traffic already in the channel has priority. If a station is transmitting, all other stations just listen. Stations on the network determine if the channel is busy by listening for the radio frequency signal or carrier from another station (the "carrier-sense" portion of CSMA/CD). This technique is really not much more complex than the squelch feature on a citizen's band radio or mobile telephone. (2) If the channel is clear (or when the channel clears), any station may

proceed to transmit. If two stations decide to transmit a message at about the same time, they may detect a garble or collision with another message. The affected stations then cut short their transmission and wait a period of time before attempting a retransmission. This is the collision-detection feature of CSMA/CD.

This second rule has a special feature that insures that each station waits a period of time set specifically in its program. This time varies according to the number of failures it has experienced (kind of a frustration level!). This assures that two

Glossary of Local Network Terms

This glossary presents technical and operational words that appear in discussions about local networks.

access method—This is an IBM term with a precise meaning. It refers to specific kinds of communications software which includes some protocols for exchanging data, constructing files, and other functions. This term is used in the local network context to refer to the method of determining which device has access to the transmission medium at any instant. CSMA/CD is an example of an access method.

ACK—A positive acknowledgment control character. This character is exchanged between system components when data have been received without error. This control character is also used as an affirmative response for setting up a communications exchange.

Advanced Communications Function—An IBM program package to allow sharing of computer resources through communications links. Supports SNA.

ANSI—American National Standards Institute. Develops and publishes standards for codes, alphabets, and signaling schemes.

application layer—The seventh (top) layer of the OSI architecture. Not described in detail by the architecture. This layer determines the interface of the device with the user.

ASCII—American Standard Code for Information Exchange. More correctly known as USASCII because of some change in recent versions. A method of coding digital signals. The ASCII character contains seven bits; an eighth parity bit

is often added.

asynchronous—A method of transmission in which the time intervals between characters are not required to be equal. Start and stop bits are added to coordinate the transfer of characters.

background program—A program that performs its functions while the operator is working with a second, different program. Communications programs often operate in the background mode on word processors. They can receive messages while the operator is processing words. The messages are stored for later display.

bandwidth—The range of frequencies a circuit will pass. Analog circuits typically have a bandwidth limited to that of the human voice (about 3 KHz). The square waves of digital signals can be distorted by inadequate bandwidth. The faster the digital signal transmission rate, the greater the bandwidth requirement. Fiber-optic and broadband cables have excellent bandwidth.

baseband—Transmission of signals without modulation. In a baseband local network, digital signals (1s and 0s) are inserted directly onto the cable as voltage pulses. The entire bandwidth of the cable is consumed by the signal. This scheme does not allow frequency division multiplexing.

baud—A measure of transmission speed. The reciprocal of the time duration of the shortest signal element in a transmission. In RS-232-C ASCII, the signaling element

is one bit.

bisync—Binary Synchronous protocol. An IBM byte-oriented, link-layer communications protocol that is widely used. They are trying to replace it with SDLC.

block—A number of characters transmitted as a group.

bps—Bits per second.

broadband—A term used to refer to transmission media capable of passing wide-bandwidth signals. Usually classed as capable of data speeds of 19.2 Kbps or greater. In the local-network context, broadband refers to the use of frequency-multiplexed cable. Digital signals are passed through a modem and transmitted over one of the frequency bands of the cable.

BSC—see bisync.

bus—A transmission medium, usually coaxial or fiber-optic cable. This term is usually associated with networks in the tree topology.

carrier—1. A radio frequency or light-wave that is transmitted over a cable and modulated with a signal. 2. A company that provides transmission services. See **common carrier**.

CATV—Community-antenna television. Based on broadband coaxial-cable technology.

CBX—Computer branch exchange. A type of PABX. See **PABX**.

CCITT—Consultative Committee of International Telephone and Telegraph. A committee of the United Nations that develops and publishes international

stations that have collided will not collide again and that one station with the shortest wait time will not monopolize the channel.

CSMA/CD is a very efficient technique. Xerox has proven the system in various operating programs. Published results show that on a network with 120 stations operating under a normal load, stations succeeded in sending their message the first time in over 99 percent of their tries. Stations had to cut their transmissions short and try again only about 0.8 percent of the time.

Figures like these seem to show that collision detection may not be needed in the great majority of transmission attempts. Indeed, some bus networks do not use the collision-detection feature (they are just called CSMA systems). Each station simply transmits into the network when it has a message. If it does not receive an acknowledgment of its message, it retransmits the message until it does. This system is really more efficient than it seems because of the intermittent nature of data communications systems. It allows the software and equipment to be

less complex and allows other manufacturers to avoid the payment of royalties to Xerox for the use of the patented collision-detection techniques.

Catching the Ring

Two sharing schemes are used in ring networks. Both techniques involve passing a signal around and around the ring, either carrying a message or indicating that the network is clear. The first technique is called *slotted ring*. In a slotted ring network, a message called a *frame* is passed from station to station. The frame

standards.

channel—A communications path. A channel may be a physical link or a logical path described between two communicating units.

circuit switching—A method of communicating in which a dedicated communications path is established between two devices, bandwidth is guaranteed, and delay is essentially limited to propagation time. The telephone system uses circuit switching.

coaxial cable—An electrical-transmission cable with a center conductor and an outer electrical shield. Used in both broadband and baseband systems. Broadband cable has better shielding than baseband cable.

common carrier—A transmission company (such as the telephone company) that serves the general public.

communications controller—A programmable computer "front end" in the IBM SNA network.

contention—The condition when two stations attempt to use the same channel at the same time.

control character—A character used for special signaling. Often not printed or displayed, but causing special functions such as the movement of paper in a printer, the blanking of a display screen, or "hand-shaking" between communicating devices to control the flow of data.

cps—Characters per second.

CRC—Cyclic redundancy check.

cross-talk—The spillover of a signal from one channel to another. In data communications it is very disruptive. Usually, careful adjustment of the circuits will eliminate cross-talk.

CSMA/CD—Carrier-sense multiple-access collision detection. A network-access technique by means of which stations sense the absence of a carrier on the medium and begin to transmit. If two stations transmit simultaneously, they detect the collision and cease transmitting. Each waits a period of time determined by special noninterference techniques before initiating transmission again.

current loop—An electrical interface that is sensitive to current changes rather than voltage swings. Used with older (often Baudot-encoded) teleprinter equipment.

cyclic redundancy check—(CRC). A numeric value derived from the bits in a message. The transmitting station uses one of several formulas to produce a number that is attached to the message. The receiving station applies the same formula and should derive the same number. If the numbers are not the same, an error condition is declared.

Data Access Protocol—A specialized protocol used by Digital Equipment Corporation.

data-flow control—A communications layer in SNA that creates and responds to outgoing and incoming messages.

data-link control—A communications layer in SNA that manages the physical data circuits.

data-link layer—See **link layer**.

DB-25—The designation of a standard plug-and-jack set used in RS-232-C wiring: twenty-five pin connectors, thirteen pins in the top row and twelve in the bottom row.

DCE—Data communications equipment. A common designation for communications equipment such as computers and

modems. Uses a female DB-25 chassis plug.

delay—In addition to the common meaning of a pause in activity, delay can also be a kind of distortion on a communications circuit. Delay is the property of an electrical circuit which slows down and distorts high-frequency signals. Devices called equalizers slow down the lower frequencies and "equalize" the signal.

distortion—Any change to the transmitted signal. May be caused by cross-talk, delay, attenuation, or other factors.

Distributed Systems Architecture (DSA)—A Honeywell architecture that conforms to the Open System Interconnection model proposed by the ISO. It supports X.25 for packet switching and X.21 for packet-switched and circuit-switched network protocols.

DTE—Data terminal equipment. A common designation for data processing equipment such as printers, terminals, and computers. Uses a male DB-25 chassis plug.

EBCDIC—Extended Binary-Coded Decimal Interchange Code. An eight-bit code used primarily on IBM business systems.

equalization—Balancing of a circuit so that it passes all frequencies with equal efficiency.

Ethernet—A baseband local-area network marketed by Xerox and developed jointly by Xerox, Digital Equipment Corporation, and Intel.

field—A particular position within a message frame. Positions are labeled as the control field, flag field, and so on. Bits in a particular message have a meaning for stations on the network.

consists of the leading and trailing information needed for a complete message, but the information elements of the message itself are left blank. A station with a

IN A SLOTTED ring network, a message called a frame is passed from station to station.

message to transmit fills in the message information as an empty frame goes by. All stations read all frames as they go by. The receiving station removes the message from the frame and sends it on its way. When the original transmitting station receives the frame back again, it knows that the message has been received and marks the frame as empty. This kind of production-line technique assures that timing and spacing of the system are kept constant.

Because of all the frame reading and handling, slotted-ring systems are not very efficient. The transmission speed of the system may be high, but the throughput of the system is low because of all the processing involved.

A more efficient form of message passing frequently used in ring networks is token passing. A token consists of a very short message that circulates around the ring, indicating: "The channel is clear." When a station has a message to transmit, it grabs the token and changes it to read: "Here comes a message." The station then transmits a message of any length. After the message is transmitted, the station again changes the token to read: "The channel is clear." Token passing is a popular scheme because it allows stations to pass messages of variable length with little network time needed for management overhead. The token-passing technique may also be used on bus networks with good results.

Frequency Division

The time-division techniques we have just examined are similar to the techniques of using stop signs and stoplights to control highway traffic. Another method used to regulate traffic flow is that of

GLOSSARY OF LOCAL NETWORK TERMS/CONTINUED

frame—A group of bits that includes the message and address information.

frequency-division multiplexing—A technique for combining many signals on one circuit by separating them in frequency.

functional-management layer—Formats presentations in SNA.

gateway—A device that connects two systems, especially if the systems use different protocols. For example, a gateway is needed to connect two independent local networks or to connect a local network to a long-haul network.

handshaking—Exchange of control codes or specific characters to control the data flow.

HDLC—High-Level Data-Link Control. A comprehensive standard developed by the International Standards Organization (ISO). It is a bit-oriented link-layer protocol.

IEEE—Institute of Electrical and Electronics Engineers. A professional organization that has defined several I/O standards.

International Standards Organization (ISO)—Best known for the development of a network model called the Open System Interconnection (OSI) Reference Model.

Internet Protocol (IP)—A standard protocol for communicating between devices on different networks. NBS and DOD have both published an IP standard. The two are very similar.

LAN—Local area network.

lightwave communications—Usually, communications using fiber-optic cables and light generated by lasers or light-emitting diodes (LEDs). Also may refer to systems using modulated light beams passing through the air between buildings or other adjacent locations.

link layer—The second layer in the ISO architecture. This layer performs the function of taking data from the higher layers, creating packets, and sending them accurately out the physical layer (layer 1).

mark—A signaling condition equal to a binary 1 (see space).

media—Plural of medium.

medium—The conduit used to move information: coaxial cable, fiber-optic cable, and so on.

midsplit—A type of broadband cable sys-

tem in which the available frequencies are split into two groups, one for transmission and one for reception. Requires a frequency converter.

multipoint line—A single communications link for two or more devices shared by one computer and more than one terminal. Use of this line requires a polling mechanism. Also called a multi-drop line.

network—A communications system made up of various stations. Use of the term network assumes interaction among the stations.

Network-addressable unit (NAU)—In SNA, a unit that can be the source and end of messages.

network layer—The third layer in the ISO architecture. Responsible for maintaining control over the communications links and routing data across one or more communications links. It accepts messages from the source, converts them into packets, and directs the packets to the destination.

node—A terminal location in a communications system. A node may also be a switching point where information changes format or mode of transmission.

Open System Interconnection (OSI)—A model developed by the International Standards Organization (ISO) to describe a network open to equipment from various manufacturers.

packet—A string of characters that includes the source address, the destination address, and the message itself. Different systems utilize different-size packets.

packet switching—A method of transmitting messages through a communications network in which long messages are subdivided into short packets with a maximum length. The packets are then transmitted as in message switching. Usually, packet switching is more efficient and rapid than message switching.

physical layer—The lowest layer in the ISO architecture. Concerns itself with the voltage levels, speed, and signaling used between equipment.

polling—A method of controlling the transmission sequence of communicating devices by using an inquiry to the device asking if it wishes to transmit.

presentation layer—Layer 6 of the ISO architecture. Determines how the data are displayed. Concerned with format and visual presentation.

protocol—A set of rules governing the transmission of information over a data channel.

PSDN—Packet-switched data network.

ring—A network topology in which the stations of the network are arranged (electrically) in a ring or circle.

RS-232-C—An electrical standard for the interconnection of equipment established by the Electrical Industries Association. The same as CCITT code V.24. RS-232-C is used for serial ports.

RS-449—A newer standard than RS-232-C, also used for serial communications. Eventually meant to replace RS-232-C, but backward compatibility is specified in RS-449.

SDLC—Synchronous Data-Link Control. A bit-oriented, link-layer communications protocol developed by IBM. Related to HDLC.

serial port—An I/O port that transmits data out one bit at a time. Contrasted to a parallel port, which transmits multiple (usually eight) bits simultaneously. RS-232-C is a common serial signaling protocol.

session—An interconnection between two stations for the purpose of moving information.

session layer—Layer 5 of the ISO architecture. Determines how the data received are to be routed and processed. Serves as an interface between applications programs and the communications systems.

slotted ring—An access method used in ring systems which involves passing an empty message frame around the system until a station fills it.

SNA—Systems Network Architecture. A communications model developed by IBM that integrates computer systems with data communications devices. This model describes functional layers in a manner similar to the OSI model.

space—The signal condition that equals a binary 0 (see **mark**).

star—A network arrangement characterized by a central processor that communicates with outlying units arranged like the spokes of a wheel or a star. In the local-network context, the central processor is a specialized switch (PABX) that performs circuit switching.

synchronous—A transmission system in which characters are synchronized by the transmission of initial sync characters. No stop or start bits are used.

sync character—A character (two or more in bisync) sent from a transmitting station for the purpose of synchronizing the clocks in the transmitting and receiving stations.

time-division multiplexing (TDM)—A method of placing a number of signals on one communications circuit by allocating the available time among competing stations. Allocations may be on a microsecond basis.

token passing—An allocation scheme used in ring networks in which a very short all-clear message (token) is passed around the network until a station catches it and changes it to "Here comes a message." The token-passing scheme can also be used in bus networks. In this case, each station must know who is next after it and pass the token.

topology—An information industry buzzword meaning the physical design or shape of a system. Common topologies are the ring, star, and tree.

transmission control—The layer in SNA that controls sessions and manages communications.

transport layer—Layer 4 in the ISO architecture. Checks the received data, acknowledges receipt, and sends the data to a specific device (printer, terminal, or disk file).

tree—Not a leafy thing that grows in the forest, but rather a network arrangement in which the stations hang off a common "branch," or data bus, like leaves.

twisted pair—An electrical cable used for communications. Often used in PABX systems.

Virtual Telecommunications Access Method (VTAM)—One of the IBM access methods used on an SNA network.

WangNet—A local-network system from Wang Labs. WangNet is a broadband local network. Different bands of radio frequencies on the network are designed for different kinds of work. The HDLC packet format is used with the CSMA/CD access technique.

wideband—A channel or transmission medium capable of passing more frequencies than a standard 3-KHz voice channel.

X.25—A packet-switching standard adopted by the CCITT. It defines the physical interface level, the frame level, and the network protocol level of the system.

—F.J.D. and W.S.

lane markers. Lane markers provide physical separation for cars in ways that are different from the devices that regulate the traffic in time, but both types of separation—time and space—can and are used on the same roadway.

In the same way, both time and space—or either time or space—can be used to regulate traffic on an information-movement network. Information elements can be physically separated by using several different radio (or light) frequencies on the same cable. Just like a radio or television set, the stations on the network are tuned to a specific frequency to transmit and receive their messages.

Baseband versus Broadband

Network-sharing systems that use only time-division techniques (polling, reservation, slots, tokens, CSMA, or CSMA/CD) are normally called baseband systems. The expression refers to the fact that normally one signal occupies the transmission medium at any one time. Baseband networks are like one-lane roads. The cars traveling down them must take turns using the roadway. Baseband networks can use any form of transmission medium and can be found in any topology.

The alternative to the baseband network is the multilane highway called the broadband system. A broadband system allows many different stations to have messages on the network at the same time. The lane markers that divide them are those of frequency. Broadband networks take advantage of the capability of high-quality coaxial cable to carry many different frequencies at one time. These kinds of

B_{BROADBAND}
*cables are inherently
unidirectional, like one-
way streets or rivers.*

cables are said to have wide bandwidth. The total bandwidth of the cable can be divided among various stations and even among subnetworks in the same way that the commercial radio frequencies are divided between AM broadcast, FM

broadcast, television, and so on. Cable systems can carry a radio frequency spectrum about 350 megahertz (MHz) wide. This is the equivalent of all of the commercial

FREQUENCY-agile devices can bring great information-transferring power, but also higher costs.

AM, FM, and television broadcast channels plus shortwave, citizens' band, ham radio, and most public-service radio frequencies. Clearly, a cable system can carry a great deal of information!

Broadband cables can allocate the bandwidth available to three kinds of channels: (1) dedicated channels that are permanently assigned to pairs of communicating devices such as two computers. (2) switched channels, assigned to two devices on the request of a master controller, and (3) shared channels operating within their own network of devices using time-division techniques. Each group within these allocations is unaware of the others. The common broadband cable appears to each to be a dedicated network medium. Broadband cables can mix many forms of information within a local network. Channels on the cable can be assigned to various data transmission functions, but video signals and voice transmissions can also be carried simultaneously.

The stations attached to a broadband cable use an RF modem to translate between the cable medium and their own internal electrical signaling system. If a station is required to operate only on one channel, it can have a reasonably simple fixed-frequency modem that listens and transmits on one limited frequency. If the station is to be able to jump between networks (move to different channel frequencies), it can be equipped with a sophisticated multifrequency modem. These modems can be switched manually or by remote command of a cable controller (which probably is not the same device as a master network controller). These tunable modems are often referred to as fre-

quency-agile devices. Obviously, increased sophistication can bring great information-transferring power, but also higher costs.

Broadband cables use two different kinds of physical configurations. The need for these configurations is caused by the simple fact that broadband cables are inherently unidirectional, like one-way streets or rivers. A station cannot send information directly to another station "upstream" from it. To overcome this limitation, there must be two one-way streets going in opposite directions. All information is transmitted on one street, goes down to the end of the cable, and returns on the other cable, where it can be received by all stations.

The two broadband configurations are frequency translation and the use of two separate cables; both arrangements separate the transmit and receive ports of an individual station. The first configuration, called *midsplit*, splits the available radio frequencies for station transmission and the other band of frequencies for station reception. The translation between transmission and reception is done by a frequency converter. This device is also referred to as a headend, frequency translator, or central retransmission facility, but it essentially functions as a frequency converter. The converter receives the transmissions of the network stations on what is termed the "return" channel, converts them to a different frequency, and rebroadcasts them on the "forward" channel.

The advantage of this midsplit system is that only one cable is used. This cuts the cost of installation and reconfiguration. On the negative side, since the midsplit system divides the cable into a transmit band and a receive band, the total usefulness of the cable is cut in half. (Actually, additional capacity is lost because of the need to establish a "no man's land" of guardband frequencies between the transmit and receive bands.)

The other kind of broadband configuration uses two separate cables, one for transmitting and one for receiving. This provides full use of the available bandwidth. One cable is used to transmit all signals to a passive connector, and another, separate cable is used to return the signals that are still on the same frequency. This kind of system has a higher material cost to install, but it provides over twice as

much capacity as a single-broadband cable arrangement. Its other technical advantages include the elimination of undesirable receiver and transmitter interaction at each station and the ability to connect listen-only subscribers (such as video displays) to the outbound cable.

* * *

Message Addressing

So far, we have seen what kinds of media are used to connect the stations on a local network and how the time and frequencies available on the network are shared among the stations. We need to look briefly at how messages find their way between stations once they gain entry to the wire or cable.

There are three practical ways to route messages from the sender to the receiver: message switching, packet switching, and time-division circuit switching. A good example of message switching is the telex or telegram service. A complete message is developed, along with all information about the sender and recipient, and transmitted into the network. The transmission continues until the entire message is sent.

The most common form of message addressing on local networks is the use of packets. A packet of data is actually a string of characters. Each packet includes a destination address, a source address, and the message information. The message information in a packet may just be a fraction of the entire message to be sent. The packet may also include such infor-

A PACKET of data includes a destination address, a source address, and the message information.

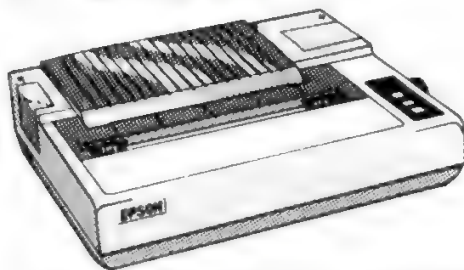
mation as an indication of what type of message it contains and a checksum of the message information. A checksum is an arithmetic number that can be derived in several ways. For example, since the digital data is considered to be a string of 0s and 1s, the checksum may be the sum of all of the 1s in the message. The transmit-

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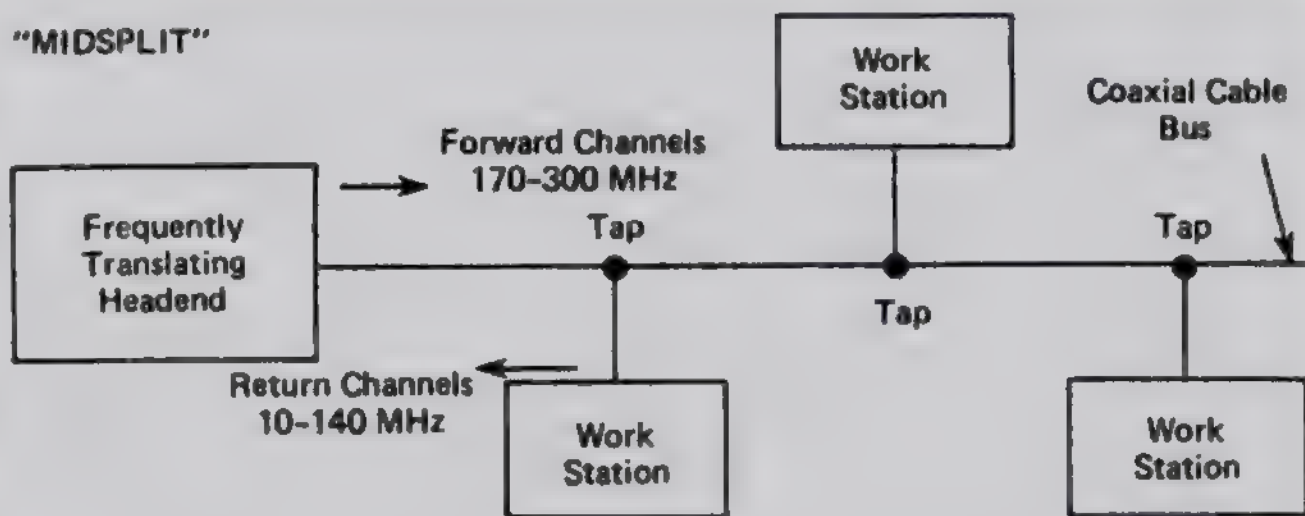
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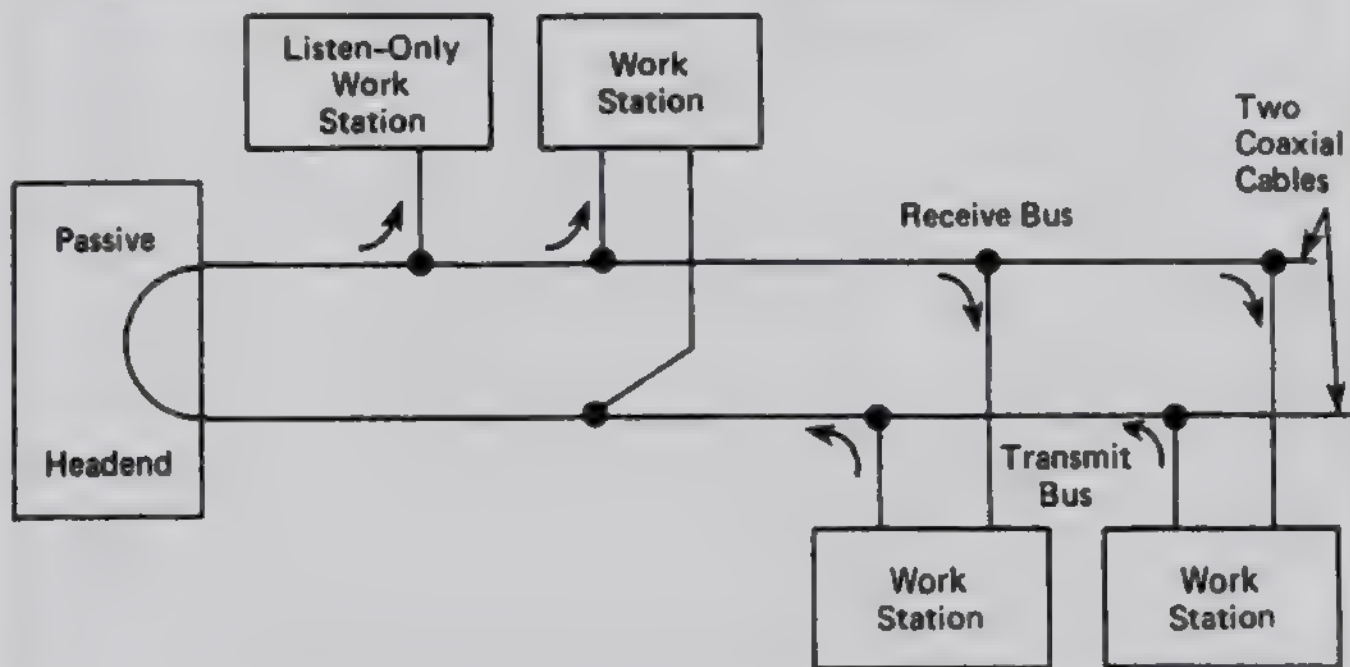
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ting station assigns a checksum, and the receiving stations recomputes it and compares it to the one assigned by the transmitting station. If the figures are not identical, the receiver can call for a retransmission. This is a form of error detection and correction. Error detection and correction schemes can involve very sophisticated algorithms that ensure extremely high accuracy in the transmitted data.

Packets can vary in size according to the design of the system. Some packets are of fixed length and others of variable length. Some systems may use packets 2,000 characters long. Two thousand characters may sound like a large message instead of a compact packet, but it is small compared to the long streams of data transmitted by large computer systems. The size of the packet is determined by the designer, based on estimates of total message length, system speed, and other factors. Certain systems allow for variable-length packets. This improves system effi-

ciency at the expense of more complex terminal software.

In packet switching, a block of data has addressing and possibly routing information added to it so that it can travel independently through relays and switches to its destination. Packets traveling independently through a system may even arrive out of order at the destination, but they can be rearranged by the network processor or the receiving station into the correct sequence to make a complete message.

A third alternative in digital switching is called time-division circuit switching. These systems use very small blocks of data (even just one character) as their transmission element. They avoid adding addressing and routing information to this small data block by the use of signaling channels that are separate from data channels. As the character or data block moves through the system, instructions go out on a separate line as to what to do with it. The coded instructions are simple, and the

data channel is kept clear of all overhead. The throughput of the data channel can be very high. Time-division circuit switching is the newer technique and has not been developed as fully as packet switching.

In Review

This has been a long and meaty chapter, but the information clusters together easily into different methods of transmission, connection, traffic control, and addressing. Here are some things to remember:

TRANSMISSION METHODS

- Media: wire, coaxial cable, fiber-optic cable.
- Coaxial cables provide good bandwidth and are the most common medium.
- Twisted-pair wire circuits can provide good economy under certain conditions.
- Fiber-optic systems provide tremendous bandwidth, but installation, maintenance, and expansion are potential problem areas unless you have experienced people available.

CONNECTION

- Topology = geometry.
- The star network is commonly used with large central-computer systems.
- The ring network has advantages where all work is distributed, but it is vulnerable to disruption at any point.
- The bus or tree configuration is widely

OPEN SYSTEM
essentially means a
system open to
equipment from different
manufacturers.

used and provides good flexibility and reliability.

TRAFFIC CONTROL

- Polling, reservation, and contention are schemes used to divide the available time among the stations on a system.
- Frequency-division multiplexing is a method of dividing the available space (frequency) among stations on a system.

- Broadband cables use frequency sharing to allow many stations to use the same cable at the same time.
- Both time- and frequency-division methods may be used on the same network or on the same medium.

MESSAGE ADDRESSING

- Packets are blocks of information containing addressing information. They move around the system until they reach their destination. The information in the packets is then put together to make a complete message.
- Packet switching is most common, but systems that send complete messages are also used.
- Time-division circuit switching has potential for very high throughput.

A Standard Network

The number of companies and businesses manufacturing data processing equipment with a data communications capability is growing quickly. Some of these devices are only pieces of a total network. They need some common conceptual basis to be integrated into the network plan or architecture. Working standards for signaling, coding, and network transmission have been in daily use for many years. But, because of differences in design and actual application, computer and terminal systems produced by different manufacturers still probably will not operate together on a network without extensive custom designing.

An Electrical Standard: RS-232-C

There's more to this standard for communications than just using a 25-pin socket and cable.

Computers communicate internally and externally via digital signals. Inside every system, direct-current voltages are switched from moderate to very low many times a second. These changes in voltage represent digital bits of information. However, the voltages used differ from one system to another. Even in the microcomputer family, different microprocessors use different voltage levels. If all systems are to communicate on a common network, some standard for external voltage levels must be set. We need a solid definition of the electrical standards to be used. This has been supplied by the Electronic Industries Association (EIA) standard code RS-232-C. Outside the United States this code is known as the International Consultative Committee Telephone and Telegraph (CCITT) code V.24. (It may also be considered a part of the CCITT standard X.21 which is recommended by the larger X.25 standard previously described. This code provides a common description of what

the signal coming out of and going into the serial port of a computer or terminal will look like electrically. Specifically, RS-232-C provides for a signal swinging from a nominal +12 volts to a nominal -12 volts at certain specified current levels and resistive loads. The standard also defines the cables and connectors used to link data communications devices. Using this standard code simplifies the job of getting information in and out of a computer, terminal, or peripheral device. A new standard, called RS-449, which will eventually be a replacement or an alternative to RS-232-C, has been adopted, but compatibility with RS-232-C is specified in RS-449. (RS-449 has also been adopted as U.S. Federal Standard 1031.) The X.21 standard calls for a 15-pin connector; RS-232-C uses a 25-pin connector, and RS-449 calls for a 37-pin connector! As you can see, the establishment of a standard, even one as fundamental as an electrical standard, is not a simple task. However,



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RS-232-C will continue to be a useful signaling standard for many years to come, so let's see how it can be described.

The terms commonly used with electrical coding standards may be confusing. They are often carried over from other systems, but once you get them straight, they are easy to understand. Because of the peculiarities of solid-state logic devices, a logic state called "0" may not indicate 0 volts. Indeed, just the opposite is true. A logic state of 0 is defined as the positive voltage (+3 to +24 volts) signal in RS-232-C. This is also known as a *space signal*. Space and mark are two designations held over from the days of mechanical printers, which are operated by electromagnets and driven by direct-current circuits. If you read any literature stating that a space should be transmitted, you know you are looking for a positive voltage or a 0 logic state.

The logic state of 1 is just the opposite. A logical 1 is a negative direct-current voltage; it is also known as a mark. You may wish to remember the sentence, "The teacher gave the student a low mark, but a logical one." The change in the direct-current voltage level serves as the signal or bit of information in the RS-232-C system. These bits are sensed, counted, and stored by data communications devices. The direct-current voltages used in this inter-

connection system can travel only about 50 feet before they lose their important electrical characteristics, so RS-232-C signaling is not used directly for long-distance communications. (The actual maximum effective DC path depends on many factors such as speed, cable type, and so on, but 50 feet is a standard for reliable high-speed service.) RS-232-C signaling is used to connect equipment divided into two groups: data terminal equipment (DTE) and data communications equipment (DCE). Data terminal equipment includes terminals of all kinds, computers, plotters, printers, and so on. Data communications equipment includes mainly modems and other special interconnection devices. RS-232-C is the most commonly used standard for local connection of computers, terminals, and modems.

RS-232-C is, however, just an electrical standard. It defines the voltage swings and other electrical parameters. It does not define what the voltage swings mean in terms of intelligent information. It is as if we said we will all use red and blue flags for signaling, but we had not defined what the position of the flags will mean. Another standard, a coding standard, such as ASCII, is needed.

—F.J.D. and W.S. (from Chapter 5)

This chapter will introduce two models of a communications network. The first is an international model established for many kinds of systems. The second is a model established by IBM.

The OSI Model

The problems of compatibility between the systems of different manufacturers were recognized early, but little was done to find a solution until 1977. In that year, the International Standards Organization (ISO) chartered a committee (Special Subcommittee 16 of Technical Committee 97) to study the problem of compatibility in data network equipment. Their work continued for a number of years and led to the publication of several versions of the Open System Interconnection (OSI) Reference Model. The term *open system* essentially means a system open to equipment from different manufacturers. This OSI reference model is useful for anyone involved in purchasing or managing a local network because it provides a theoretical framework on which you can hang practical opportunities and problems.

The design of such an open system has proven to be a very difficult task because of (1) all the manufacturers and standards organizations involved and (2) the size of the problem. It involves much more than just electrical signaling.

A local network must be thought of as a single entity. The system has many parts, but they all interrelate. The OSI model provides names for the parts of a

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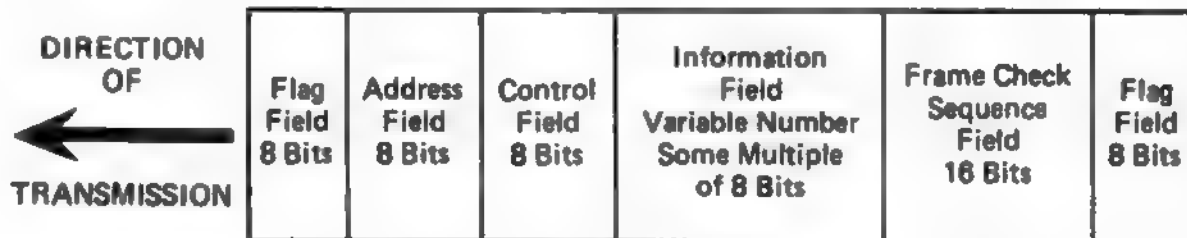
The complete system price including TANDON 848-2, enclosure, cable, and basic utility programs is \$1295 for one drive and \$1995 for two drives. For users who want to use their own drives, the basic utility programs and documentation are available for \$695. Payment is by check or COD with delivery within 10 days.



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A PACKET IN THE IBM SYNCHRONOUS DATA LINK CONTROL (SDLC) FORMAT



The construction of a packet using IBM's Synchronous Data-Link Control (SDLC) bit-oriented format.

communications network. It doesn't matter in a general sense if the network is local or international. The size of the network may limit or increase the importance of certain of its parts, but they will all be there in one form or another. The OSI model uses specific definitions to describe the various portions of the network. It speaks of "layers" of functions arranged in a hierarchy. This gives the impression that they are all neatly stacked, with firm boundaries between them. This is not the way they operate in the real world. In a real system, one printed-circuit board might perform almost all of the functions called for in several layers of the model. Still, the model provides a good way to structure your understanding of a network. It also acquaints you with more of the concepts and jargon used by professionals in the industry. Throughout this description we will use the term *layer* because the industry uses it. Please think of each layer as a function that must be performed.

The Application Layer

The OSI model has seven functional layers. The top function, the one you should always keep in mind, is the end-user application. This is where the

user when and how the user wants to be served. It is interesting to note how often this is turned on its head and we find the user serving the system. The ISO committee calls this layer 7 in its model.

The application layer is concerned with the information in the message and how well it serves the user. There are no firm protocols or standards for this function except those of common sense, utility, and logic. There are many common practices, but they are tied to the functional program being used and cannot be discussed here. The application layer is the most critical layer, but your common sense defines it.

The Presentation Layer

The next down in the model (layer 6) is the presentation function. The presentation layer prepares the information for the application. An example of this function is the conversion of a file received from a brand-X word processor into the proper format for display on a brand-Y system. Each word processor might use different codes to set the ends of paragraphs or the length of a page. The presentation function would have to know the differences and provide for them. This could be done in hardware, but it is more likely to be done in software.

The Session Layer

The session layer (layer 5) is a coordinating function. It establishes the communications link between units (like between the two word processors above) and gradually feeds or buffers the information to the devices or program performing the presentation function. The session layer also provides the sometimes critical identification and authentication functions. It recognizes users and acknowledges both their arrival and departure. In some systems, the session layer can be a driving factor in system design. In others, it is a very small consideration. When it is

most important, this job might be done by a separate micro- or minicomputer. In its minimum form, this job could be done by a couple of small integrated circuits.

The Transport Layer

The transport layer (layer 4) functions to provide a common face to the communications network. It translates whatever unique requirements the other higher layers might have into something

OFTEN WE
*find the user serving the
system.*

the network can understand. It also makes the most effective use of whatever various communications media it is connected to and selects the best or most logical route for transmission. It detects and corrects errors in transmission and provides for the expedited delivery of priority messages. It checks the data, puts it into the proper order if it came in wrong, and usually sends an acknowledgment back to the originating transport layer. It attempts to reestablish contact in the event of a network failure.

Several industry and governmental standards exist for a transport function in data communications devices. The U.S. Department of Defense has adopted a transmission-control protocol (TCP) that has many functions and options. The Bell System has also released a protocol called BX.25 which describes, among other things, the transport, session, and presentation functions.

The transport function is an important part of any communications device. It would normally involve both hardware and software and be specially configured to match both the equipment it is on and the network it serves.

The Network Layer

The network layer (layer 3) sets up a logical transmission path through a switched network. In local networks this path may only be theoretical, since the individual units are almost always electrically connected into the circuit and the paths are defined by the network topolo-

THE OSI
*model provides names
for the parts of a
communications
network.*

machines talk to the people. If this application isn't properly handled, the entire system is useless. The goal of any communications system is to serve the

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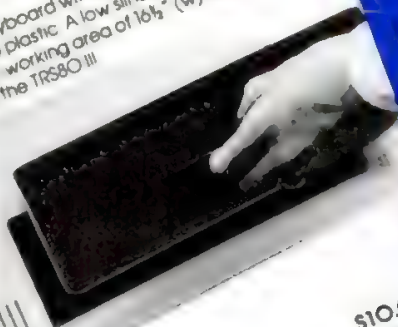
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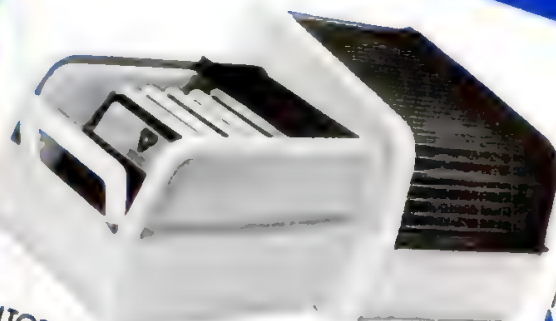


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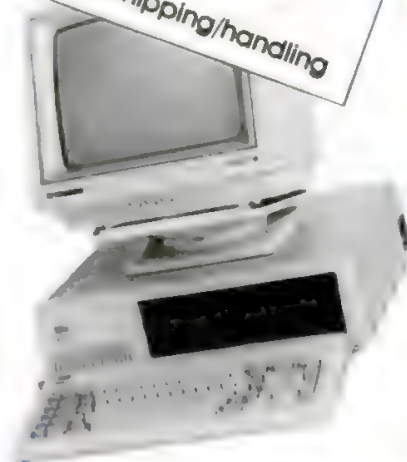


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gy. But in large systems, several transmission paths and even alternative media (dialed telephone service versus leased service, for example) may exist. The transmission path may be temporary in nature—lasting only long enough to transfer a packet of information—or it may provide continuous connection for two users of the network.

In a local network, the network control function can exist in one place (star network) or be distributed (bus or ring). It is essentially made up of software that recognizes various conditions on the network and reacts to them.

The Data-Link Layer

The data-link layer (layer 2) does the accounting and traffic-control chores needed to transfer information on an electrical link. It forms the information to be moved into strings of characters such as those used in IBM's bisync communications protocol or into blocks of bits such as those used by the HDLC protocol. The data-link layer functions like the foreman in a railroad yard who is making up a train. It puts every piece of information into the right place and checks it out before putting it on the tracks. Similarly, incoming information is broken down and properly routed with the receiving device.

The data link was originally thought of as being a function of the software in a device. It is increasingly being done by special-purpose integrated circuits requiring little external programming.

The Physical Layer

This functional level can be very troublesome and occupy the time of an expensive technician if it is not properly planned. The physical layer (layer 1) describes the electrical and physical connection between communicating units. It is often the most visible and sometimes a very troublesome part of the system, but it shouldn't be.

In 1960 the Electronic Industries Association (EIA) established an electrical standard for interconnection called RS-232. The standard has been revised three times, and the most current standard is called RS-232-C. RS-232-C is an electrical signaling standard. It conforms closely to the international X.27, X.26, V.11, and V.10 standards. This means that equipment (such as a modem and a terminal)

that conforms to these standards should be able to work together on the most basic electrical level.

There are other electrical standards, such as IEEE-488, that are also commonly

THE GOAL OF
any communications
system is to serve the
user when and how the
user wants to be served.

used for the interconnection of certain kinds of communicating equipment. Equipment designed under this standard will not operate with RS-232-C equipment.

RS-232-C will gradually be replaced by a newer standard, RS-449. However, RS-449 equipment should be electrically compatible with RS-232-C equipment (although the cables are not the same).

X.25

The three lowest layers of the OSI standard—the network, data-link, and physical interface—are described by a number of existing standards. The most commonly referenced standard is Recommendation X.25 of the Consultative Committee for International Telephone and Telegraph (CCITT). Recommendation X.25 was adopted in 1976. It has been modified many times and has several variations.

Not all manufacturers support all portions of X.25, but it is becoming increasingly important as a standard. It is the best thing we have to describe the connection between equipment on a public packet-switching network. The recommendations of X.25 carry over into local networks with little or no change.

IBM and SNA

IBM began promoting its Systems Network Architecture (SNA) in 1975. SNA is a network architecture or plan like the OSI architecture. Like the OSI architecture, it describes the various jobs to be done by stations communicating in a network in terms of a series of functions or levels. The OSI architecture and SNA have many sim-

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ilarities, but the names differ. SNA's levels are described differently from those in the OSI architecture. The description of SNA includes many specific terms, such as node, network-addressable unit, physical unit, and logical unit.

An SNA node is a general term for a central processing unit (computer), a communications controller, and the local communications elements. SNA can be applied to any size network covering any geographical area, so it also defines the methods of communications between nodes. SNA defines subarea nodes and peripheral nodes. Essentially, subarea nodes can communicate between themselves while peripheral nodes can only communicate with a subarea node.

Network-addressable units are the hardware and software within terminals and computers that interface with the network. This is not a difficult idea to express conceptually, but in a terminal or computer the network-addressable unit may consist of several pieces of hardware and software that can serve several different functions. There are two kinds of network-addressable units, the logical unit and the physical unit. The terms simply indicate the difference between the software the user sees (logical unit) and the equipment the network sees (the physical unit).

The top level of the SNA structure is the end-user services layer. The end user may be a person, a device, or even an operating program. In their later literature, IBM calls this the services-manager layer.

SNA'S LEVELS
*are described differently
from those in the OSI
architecture.*

The second layer of SNA is called presentation services. This layer provides the interface between the end user and the network. It gives the using person or device certain rules, capabilities, and methods of using the network.

The third layer, the data-flow-control services, determines if units on the network will operate in the half-duplex or

Phase IV

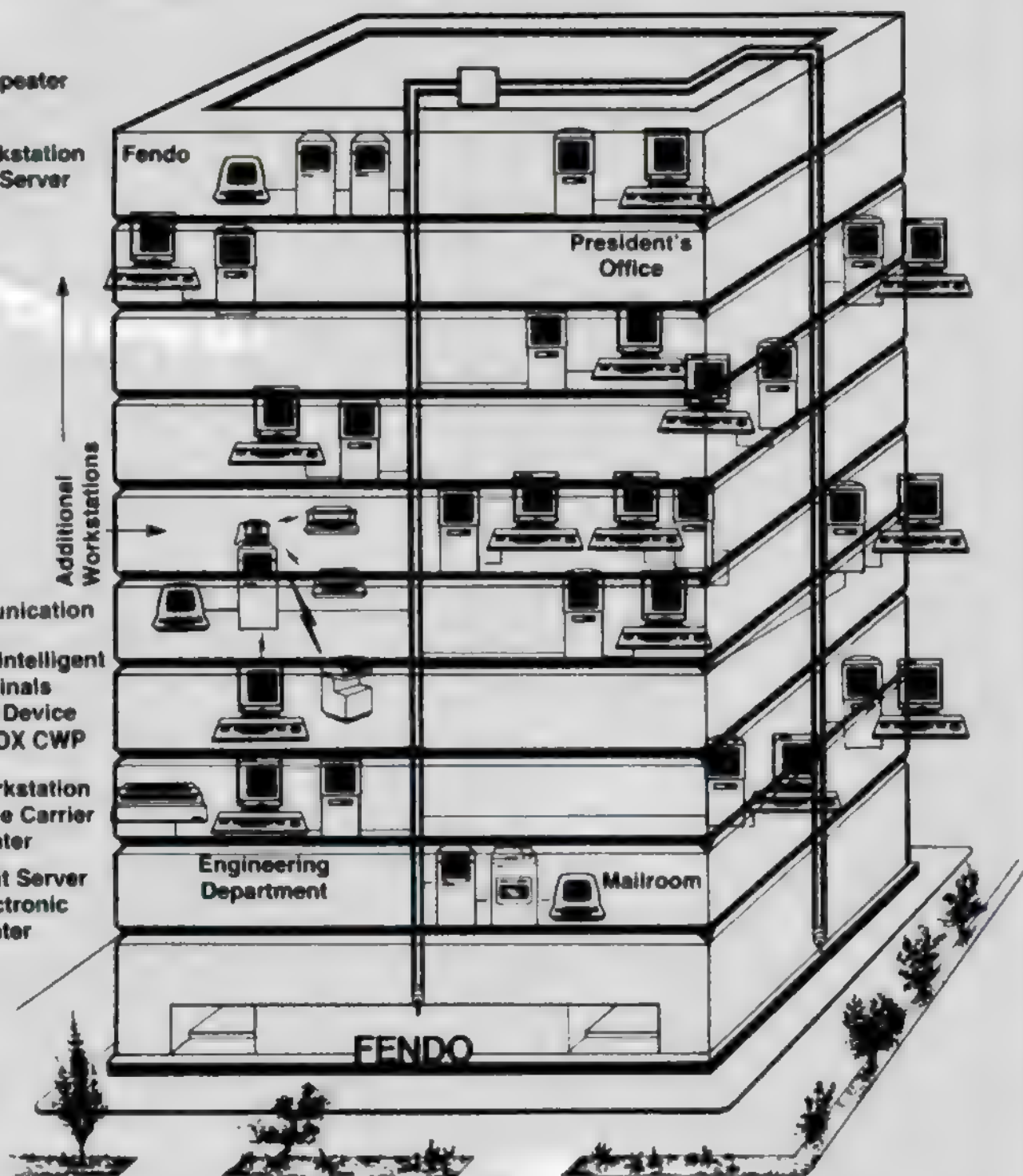
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An Ethernet network may be integrated throughout an office building. (Diagram courtesy of Xerox Corporation. All rights reserved.)

full-duplex mode. It will "chain" together messages or parts of messages that can be logically grouped because they are going to the same receiving station. It also groups data according to specific transactions (the airline reservation for a certain customer, for example), if that is appropriate.

The next layer, the transmission-control layer, provides the protocol used between two communicating devices to control and acknowledge the transfer of information. The transmission-control layer constructs the message headers and attaches them to the message. The headers are useful in performing the session-level pacing function. This function simply means that communicating units pace their transmission speeds based on acknowledgments and message numbers

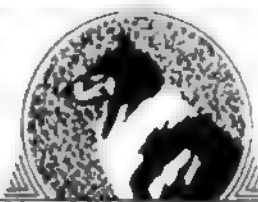
contained in the message headers.

The path-control layer provides the logic to route messages through a network. The path-control logic determines how a message travels when more than one route exists in a multiconnection network.

The data-link-control layer performs the important function of error detection and correction. It detects errors occurring during transmission and requests retransmission. Data-link control may use the SDLC protocol or a protocol called channel data-link control, common in IBM 370-series mainframe computer systems.

These SNA functions combine to create, route, control, transmit, and acknowledge messages flowing through a network. This description of SNA has been condensed to the point where an IBM designer would barely recognize it, but it serves

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A.B. Dick Magna SL	dedicated word processor *	\$14,500	83
Write	CP/M†	\$400	82¼

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Why all the fuss?

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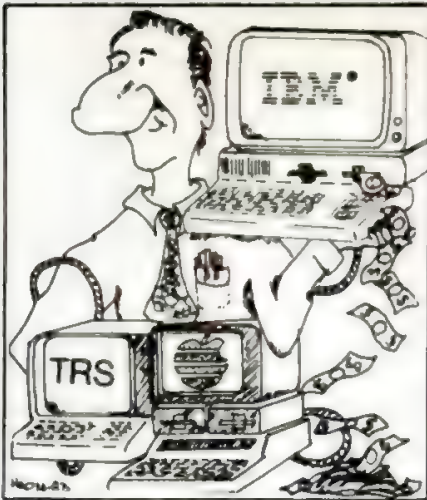
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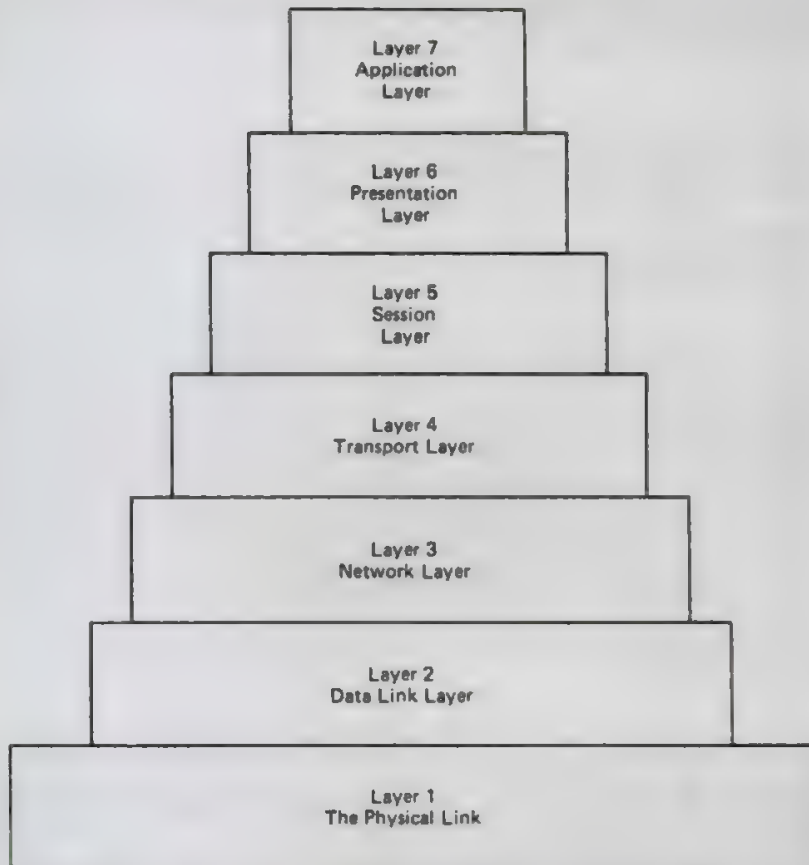
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SNA is not commonly used as a local

SNA IS NOT
commonly used as a
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Frank J. Derfler, Jr. is a telecommunications manager with the Department of Defense. He is the author of *Microcomputer Data Communication Systems* and a contributing editor for *PC Magazine*. William Stallings is a senior data communications consultant at Honeywell, Inc. He has managed the design and development of several data communication systems. He received his Ph.D. in computer science from M.I.T.

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The Pulitzer Prize winning author of the current hit play 'night, Mother explains why computers enhance creativity.

Marsha Norman: A Broadway Playwright Collaborates With The PC

Marsha Norman has a lot in common with the IBM PC. Smart, versatile, and attractive, they both have a way with words. They've both received virtually universal acclaim in their respective fields. And they both worked on Norman's fifth play, 'night, Mother, which won her the 1983 Pulitzer Prize for Drama.

'night, Mother, might be called a "real-time" drama; clocks onstage drive home the point. The premise of the two-character work is simple: A woman announces she is going to kill herself, and her mother tries to talk her out of it. But the emotions and issues that develop are highly complex, and the play has drawn accolades from even the crustiest Broadway critics. 'night, Mother, earned Norman the 1983 Susan Smith Blackburn Prize for "Most Outstanding Play Written by a Woman for the English-Speaking Theater." It also received four Tony nominations—two for Best Actress, one for Best Director, and one for Best Play.

In May, The New York Times Maga-

zine featured Norman as the exemplar of a new breed of women writing for the theater. She has written for movies and television and has received grants from the National Endowment for the Arts and the Rockefeller Foundation. Her 1979 Off-Broadway success, Getting Out, has been translated into 12 languages and produced throughout the world. Her current project is a musical, Winter Shakers, in collaboration with composer Norman L. Berman.

For most of the past year, Marsha Norman has been doing all her writing with WordStar on an IBM PC. In an exclusive interview in her New York apartment, the 35-year-old playwright discussed the changes the PC has made in her work, her strong opinions about her machine, and her thoughts about the electronic future.

PC: Did you write 'night, Mother on the PC?

NORMAN: No. I did the revisions for 'night, Mother on the PC. What I did—in order to learn how to use it—was put 'night, Mother in, put the Shaker musical

in, and The Holdup, which is an old play of mine. But actually I've written the Shaker piece on the PC, because I've virtually thrown out the old version. As a matter of fact, if the Shaker musical is a success, it will be the PC that's responsible.

PC: How long have you had your PC?

NORMAN: Since November of last year. I bought a 64K PC, the monochrome display, the NEC 3550 printer, WordStar and MailMerge—that's all. Just this morning I added a 256K card and ProKey.

PC: What did you use for your writing before you bought a PC?

NORMAN: For about 4 years I had an IBM Electronic 60, which I had to have repaired about every 6 weeks. Before that I had a Selectric. And I absolutely destroyed the Selectric. I mean, I used it until it died—literally died. You could use it as a paperweight. So I am an IBM customer.

PC: When did you begin thinking about using a computer?

NORMAN: Probably about 5 or 6 years ago. When I bought the Electronic, I knew

it was simply a stopgap measure and that the sooner I could afford a computer and the sooner I could actually get one, the better it would be for me. I knew from the beginning that's what I wanted. That's just me. I'm interested in hardware and gadgets. I minored in astronomy. I'm just interested in the future. I want as little labor as possible between me and my work.

I WANT AS *little labor as possible between me and my work.*

PC: Did you know any writers who were using computers at the time?

NORMAN: I would read the pieces that came out occasionally—so-and-so is using a word processor, that kind of thing—but I really didn't know anybody else.

The Power of Possibility

PC: What made you finally decide to go out and get one?

NORMAN: Simply having the money. And having some confidence that the technology was stable, that I wouldn't want to or have to replace the system anytime soon. And I realized that I was at the point where it was costing me money not to have a computer. It was costing me time and energy, and I really do think it was lowering the quality of my work. I've always been really driven to work, so I would always be working on two or three things at a time, and they were always a hundred pages long each. So I was constantly typing. Really, until I got the computer I was typing for a living.

PC: Why did you decide to buy a personal computer instead of a stand-alone word processor?

NORMAN: Well, I did an awful lot of reading, and I attended seminars, and I realized two things: First of all, that the computer was less expensive than the stand-alone word processors, and second, that it was more flexible—that there were all kinds of things it could do. I mean, one of the things I believe in in my life—and

you see it in my work—is that power of possibility. I knew that while I was not buying the machine in order to become a programmer, who knew what would happen once I had it?

For example, I guess it was about a month before I actually did any programming. But I had bought the IBM Typing Tutor so that Dann, my husband, could learn to type on the computer so that I could give him my old typewriter and then he could do his own letters if he wanted to. Then he complained that the Typing Tutor didn't have real sentences to practice on. So I thought, well, all right. I spent all of Saturday and Sunday learning just enough BASIC to devise a typing test for Dann—one that would reward him with a lovely compliment and give him a new sentence if he typed it correctly, and one that would insult him terribly and give him the old one to retype if he made a mistake. And then I fooled around some with the Play command. As a matter of fact, one of the songs from the new Shaker musical is on the computer.

Take Over My Life—Please!

PC: Did you have any prior experience using computers—terminals, anything?

NORMAN: None. But that's just a part of my personality. I'm just not afraid.

PC: You had no technophobia? You had no feeling of, my God, this thing is going to take over my life?

NORMAN: No, I could hardly wait for it to take over my life. That is exactly what I wanted it to do.

PC: How'd you go about shopping for a machine?

NORMAN: I read the Peter McWilliams Word Processing Book, I began to read various magazines, and I talked to people who had machines. It was actually a seminar at the Writers Guild that completed the decision-making process for me in terms of both WordStar and the IBM. I was sort of inclined to go with IBM because I'd been their customer, and my natural inclination is to go with design. I loved the way the PC looks. So the research was all by way of making sure that I wasn't just making a design decision.

But I also loved the keyboard. I tried the Victor and I tried the Apples, and I really just loved the feel of the PC keyboard—in spite of the misplaced keys.

PC: A lot of writers totally hate that keyboard. After 2 minutes, they've hit so

many backslashes that they walk out of the store.

NORMAN: Well, I did a little training thing. All I had in the house that I could use as a tactile key was a small Band-Aid. So I turned it around; I put the sticky parts of the Band-Aid down on the Return key so that when I hit it, what I felt was the fuzzy part that would normally go on the cut. I mean, here you have a \$7,000 machine that you're learning to use with the help of a Band-Aid.

PC: You didn't do anything about the left shift?

NORMAN: No. I just never used it.

PC: Did you on your typewriters?

NORMAN: Yes. But I just decided I didn't want to deal with it.

Dealing with Dealers

PC: How did you pick a dealer?

NORMAN: I picked Datel, which I've come to regret, because somebody else at the seminar told me that they'd had good experiences with one of the people there, who is quite knowledgeable and wonderful to deal with. What I had heard about Datel was that they would send people to your house and that they had their own service operation so that I didn't have to deal with IBM right away. The kid who came to install it was quite wonderful. They're wonderful individual people, but there's nobody in charge at Datel as far as I can tell, and they've been totally and completely inept.

The tractor feed that I ordered for the NEC was not available and is still not available. I mean, I've had the machine for 7 months now, and I have no tractor

MY NATURAL *inclination is to go with design. I loved the way the PC looks.*

feed. Ordered it 7 months ago, paid for it 7 months ago, and I can't get either my tractor feed or my money from them. Since I've been dealing with Datel, two consecutive people who've been assigned to me have left, and nobody seems to know what's going on.

Design an IBM PC system layout that's comfortable.

There's also a real discriminatory thing about women going in to buy computers. You walk in, and they think, "Oh, are you here to pick up paper for your boss?" It is really tacky. So you have to stand there and prove that you know what you're doing. You have to sling some of the language around, and then they say, "Oh, you've been here before!" which is really insulting.

PC: In fairness, that also happens to guys who don't happen to be wearing business suits. The salesmen figure you're not likely to place an order for two dozen machines. And it's true at IBM, too. As an IBM customer, did you go to a Product Center?

NORMAN: Yes. I made an appointment and said that I was interested in word processing. The woman took me over to the desk, offered me coffee, and we had a nice little chat. Then she took me up to the Displaywriter. And I said I really don't want a Displaywriter, I want a PC. And suddenly she turned into a different person. She yelled across the room: "Harry! Can you take this one?"

Their price was higher than Datel for non-IBM equipment, and I just found them very cold. And I am really disappointed, because in all my other dealings with IBM through the years, I found them to be thoughtful and caring and concerned. And here I am, one of their loyal customers—of course, they had no way of really knowing that—and I went in and I said this is exactly what I want, what are the prices and when can you have it for me? The guy did not even call me back to see if maybe I had decided.

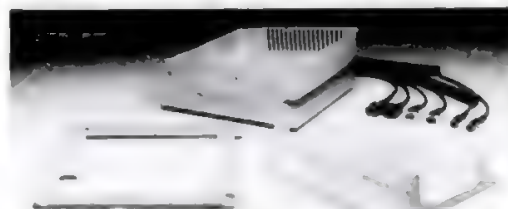
But at the time that I was ready to buy—I mean, the day I was ready to buy—IBM didn't have any machines and Datel did. I think in the end it was one of those accidents.

An Hour of True Panic

PC: How long did it take you to get the machine up and running?

NORMAN: They came and installed it. There was an hour of true panic when I thought, "Oh Lord, if it's off now and I turn the switch this way, will it be on? And what happens if I haven't done something correctly before turning it on?" I mean, I had all of that terror. So I just stopped everything, and I spent a couple of hours reading and proceeded slowly, and then by the end of the day I was really comfort-

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improve productivity

able that I couldn't break it. By the end of a week, I was doing all the very simple things that I needed to be able to do. And I guess it took me about 3 weeks to be totally fluent in WordStar—to feel comfortable and know that I never wanted to work any other way.

PC: Why did you choose WordStar?

NORMAN: I really needed a screen-oriented program. I wanted one that was as flexible and elegant as possible. I just like the arrangement of WordStar. With the exception of formatting for screenplays, I really felt it was just the program that would do everything that I needed.

I've found it to be real exciting to work with. I mean, I really love knowing that it will do so much more than they actually tell you it will do—that it has a kind of presence of mind. One command I use all the time is Ctrl-XY: delete the line under this. And it works. Whether it's just the fact that the computer goes back and reads Ctrl-X, Ctrl-Y, I don't know, but in my mind it's not two separate actions.

Manual Labor

PC: Do you agree with the complaints about how hard WordStar is to learn?

NORMAN: Absolutely. They ought to have some of us—writers—do the manuals. I found I had to use the Naiman Introduction to WordStar book. Actually, I bought it before I bought WordStar; that was one of the ways I determined that I wanted WordStar. First I worked through it using that book. Then I used the manual and realized what it could really do, and realized the things that were appropriate for the PC and the ones that weren't. The books and manuals don't really deal with that.

PC: Did you use WordStar's training guide?

NORMAN: Yeah, particularly for the block commands, and some of the dot commands, which were so hard for me to learn. Still, to this day, sometimes I will copy what I already have set up at the top of one file to some other file so I don't have to remember whether the .op goes before or after the header and the .pnl. I mean, who ever wants page numbers at the bottom of the page?

PC: As a writer, how do you feel about the computer documentation you've seen?

NORMAN: I find it all unbearably confused. First of all, it seems to me that the people who write the manuals have no

idea who is going to be reading the manuals. I mean, they really ignore some of the classic issues that you always have to deal with as a writer. And I was really irritated at the WordStar manual and at the PC manuals, although I understand they

THE PEOPLE *who write the manuals really ignore some of the classic issues that you always have to deal with as a writer.*

are the best. But I found them just impossible. When there are four separate directions about how to install WordStar—I mean, four separate sets of directions, all of them different—that's just crazy.

For example, my WordStar is now installed for a parallel printer instead of the NEC, simply because I read an installation instruction and it didn't tell me to go do the installation for the NEC. It works just fine, though.

PC: Have you had any hardware or software problems?

NORMAN: I've had no problems whatsoever, although in installing a new memory card, Steve Siebert of Bibliophiles just pointed out that the display card on my machine is missing its back bracket and front card guide. It's just sitting loose in the slot—something else Datel did wrong.

PC: The writer's worst fear seems to be losing text. Has that ever happened to you?

NORMAN: I've never lost anything. But I'm real careful—just as a human being I'm careful—so I think about those things. I remember the first time I went out past the margins and suddenly got this whole array of text sliding off the left end of the universe. It really upset me. But that's as serious an error as I ever made. And of course, the text came right back.

The Most Wonderful Gift

PC: What does working on the PC offer you that working on a typewriter doesn't?

NORMAN: It keeps me from thinking that

anything that I've written is permanent until I decide to make it permanent. And what I think has happened is that my mind has assimilated the Save commands so that I now think of everything as just a RAM entry that only goes to disk months and months and months later. And that's wonderful for me.

So often in the past I've been concerned about how to do alterations and not change the total number of pages. I've done rewrites where my primary concern was how to have to retype as little as possible. And that habit was so bad; it was such an ingrained part of the way that I worked, that I'm horrified to know it now.

The Block move is probably the most wonderful gift to writers. It allows you to see quickly what a change will mean, keep it, go back to the way you had it, or make the other changes that the first change makes necessary. You can't do this with the typewriter, because by the time you get through making the changes, you're tired, or you've forgotten what it was you wanted to see. You can't accomplish the job quickly enough to keep track of what you're doing. With a computer, you can make total structural alterations, like taking down the walls for a minute or replacing every other board in the floor.

Somebody, Archimedes probably, said he could move the earth if he had a lever long enough and something to stand on. Doing rewrites, your brain is the lever long enough, and now, the computer is what you stand on. Before I had my PC, there were changes that never even occurred to me, because some time manager in my brain knew how long it would take to test the ideas. Now, I can do whatever I can think of to do. It's that powerful a tool. The computer allows me to be as good as I can possibly be, because it doesn't cost me anything to revise.

History's Loss

PC: Do you save copies of old versions as you revise?

NORMAN: When I've completed a draft that I think is a sort of working draft, I will generally print one out. I'm tending to save those, though I think that what will definitely suffer as a result of working on the PC is the archival responsibility.

For example, with 'night, Mother, I had the most wonderful collection of letters and notes and old pages—I've even given

some of those pages away as presents—where new speeches will suddenly be written in red ink on the side of the page. I'm never going to have that now. And that's a shame. But that's only history's loss, it's not mine.

But I do keep some old versions. This happened to me with *The Shakers*, because I did a startling revision of *Winter Shakers*. I mean, I did basically a completely new script. And I'd have a file called 1SHAK5.TXT—you know, first act of *Winter Shakers*, scene 5. I would go through and I would make a file called 1SHAK5.NEW, and then one called 1SHAK5.NE2, so that at any given moment I would have three or four versions of the same scene, which I would keep coded. It was a way to keep two or three drafts on a disk, and then when I finally decided which one I wanted, I just went through and deleted all of the dumb ones.

I am to the point now where I just happily erase. I have this whole series of KB, then QC, then KK, then KY, and suddenly the whole thing is gone, and it's wonderful, but it's this little automatic eight-character sequence. It'll probably be a ProKey sequence now.

A Forgiving Personality

PC: Do you think that the computer helps make you a better writer?

NORMAN: Oh, absolutely. What I think it does is remove the limitations that were

PC: DO YOU think that the computer helps make you a better writer?
NORMAN: Oh, absolutely.

created by the typewriter. It really says to me, it's not finished until you can't think of anything better. There's no way that you're going to run out of time. We have simply given you, with this machine, all the time you could possibly need—every opportunity to think about it again.

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puter is that it's part of its personality to be forgiving, and it doesn't laugh at you, and it doesn't quit, and it doesn't say "Oh, come on, haven't we done that enough?" We had a fascinating session just before we went into rehearsal with 'night, Mother where Tom Moore, the director, and I sat down at the computer—he had never even been in front of a screen before—and went through the play line by line as a way of really talking about it. The lines would just roll by, and he would say, "Well, now, I'm thinking about that beat," and I would say, "See this cut I made in this speech?" and we worked through the script sentence by sentence. It allowed us to attend to the script in a kind of detail that we would never have done before.

It also allowed us to make changes instantly. Normally, you know, you'll have a conversation with the director, and you'll be tired after an hour and a half, and you go home and do the rewrites. And then you have to have another conversation where the director comments on the rewrites, and it goes on and on—endlessly. This way, Tom and I sat there, I did the revisions, I showed him the ones I wanted to make, I quickly responded to what he had to say, and we actually produced the rehearsal copy of the script right there together, and printed out a copy of it, and he took it home. With 'night, Mother, all the revisions since the Boston opening were made on the machine.

File Management as Character

PC: How is the PC helping with your new musical?

NORMAN: The computer is fabulous in

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doing something like a musical. For the Shaker piece, I have the title page, I have the cast and the set, but the title page is one separate file, so that every time I do a revision I just go in and change the date and that's all done. Then I have the scenes as separate files, and I have the lyrics as

separate files. So that with MailMerge I can print out a set of lyrics, I can print the whole thing, or I can work on the scenes individually and not alter the total length or configuration of the piece. To keep it organized that way would be so difficult to do if you were typing.

But I think file management is just one of those things that ultimately says who you are as a human being. I have a friend who has WordStar with 64K and wrote a play with two files. Well, now that's just crazy. Can you imagine how long he is sitting there watching WAIT? I mean, just forever. Maybe if he'd had more memory or organized his files better, he'd still be writing plays.

I have also managed not to have the page numbers at the bottom so that nobody reading it will have any idea how long it actually is, which I think is just one of those great advantages. You don't want somebody to say, "Oh, my, it's the Shaker musical," and then turn to the back and see that it's a hundred and two pages long and panic.

I made a decision this final time through that instead of using particular names, I wanted to indicate that this was the Heard Deacon, or the Trading Deacon—I wanted to go ahead and use their work titles, so I used the QA Find and Replace. I mean, I just would never have done that before. I would've just said, "Listen, if they can't figure out who the characters are, the hell with 'em."

Writers in Terror

PC: How do other writers you know view computers?

NORMAN: With terror. Stark terror. I've run into almost universal terror. I am just about the only writer that I know who's using one. And I'm the only playwright I know who has one.

Wendy Wasserstein just got a Guggenheim, which is \$20,000, and I told her the best single way to spend that money is to buy a word processor. I spent 45 minutes at a party trying to talk to her about it, and she just didn't believe me.

I cannot imagine being without one. I don't understand their terror. Maybe they think the writing's coming out of the relationship to the typewriter, or that somehow the closer to the quill pen you get, the better you are, but I just don't believe that. Our characters have to change so we can have something to write about. It only

seems fair that we change in order to present our characters more clearly.

PC: What is it about writers? Why do so many of us have this antipathy toward technology?

NORMAN: Oh, because we are captives of the voodoo. I mean, we think if we have

SPEED IS
really the least of the
advantages.

this little frog sitting by our desk, we will have good ideas. Or if we don't talk about it, we will somehow be able to keep all of our best secrets. We are just superstitious as a group. We are afraid that something might interfere with this force, this creative mystery. And what I am finding is that the computer has only made the mystery more powerful, more exciting, put me in touch with it in a way that's more direct.

PC: Do people say you'll be a worse writer in the future because you use a computer?

NORMAN: Yes. People say it will destroy me. You will just be writing all this fast talk, they say. But the interesting thing once you begin to work is you see that the speed is really the least of the advantages. What's important is what it does in absolutely freeing you to think of what all the possibilities might be.

Also—though I never really did have much trouble with this—the computer totally eliminates writer's block. It used to be that you would sit there, and you would pore over the sentence, and you wouldn't type anything because you didn't want to have to retype it. Now, you can simply sit there and type "The quick brown fox jumped over the lazy red dog," or whatever, until you think of something to say. There is no reason to sit and stare anymore.

I also find that there are some other wonderful effects. The letters I write are funnier, because, once again, it doesn't cost me anything to make a joke. If the joke doesn't work, I'll go back and take it out. There's a kind of flipness, quickness. In that way it's almost more like the tele-

Arrange your PC any way you like.

phone in that it's a kind of instant writing. You don't have to consider that this thing is going out for all of posterity, you don't sit there and think "I only want to have to type this once so I'd better be careful."

Burnout and Possessiveness

PC: Do you see any negative aspects to using the computer?

NORMAN: There is one danger I have learned about. And it's only dangerous for me, given my tendency to overwork. My old schedule was that I would work 6 or 7 hours a day, 5 days a week, or 6 days a week sometimes. I find if I do that on the computer, I am absolutely exhausted. I have nothing left. I don't have any conversation left. I don't have any ideas left, I have nothing. The computer allows me to accomplish in 3 hours what it would have taken me 2 whole days to do before. So that if I work 6 hours a day, 5 days a week, I'm suddenly 4 weeks ahead. I mean, I've used up a month's worth of energy in a week. And I really have to be careful not to burn myself out using it.

PC: So there's really a greater intensity working on the machine.

NORMAN: Yes. The computer is the ultimate solution to that business of "I can't type as fast as I think." I feel the computer really is able to keep up with me, so there's no resting at all. As soon as I think of it, it's done. And so what I have to do is to be very careful. I have to consciously provide myself with that reflective time, the leisure that I used to get normally because I would be worn out physically from typing. Now I have to stop even though I am not tired.

PC: Some writers who don't use a computer feel you're going to lose a lot of time by trying to figure out how to make it work or by just fooling around with it and doing things you wouldn't otherwise do.

NORMAN: Well, I don't own any games. I've only done these two exercises in BASIC. And at the moment, for me, it is simply a tool. We have none of our finances on it. I don't have any of the cookbook programs.

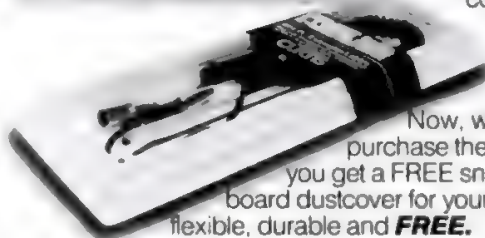
But I'm very possessive of it. And when people come in and use it or want to play with it—uhhh! I mean, the hackles go up. I'm taking it up to the country this summer, and oh, the precautions we have made about that! We have sold this apartment and are moving, and I'm going to have a study on the roof of the building

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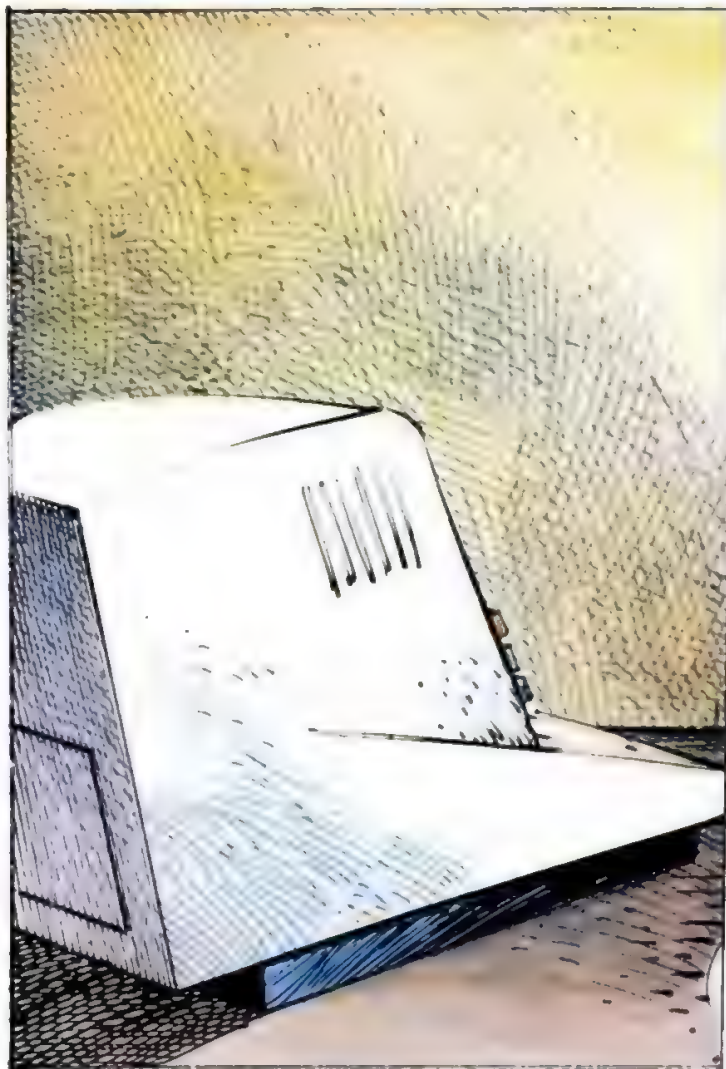
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we're moving to, and I'm already real concerned about the radiator and the humidity and the lock on the door and all of that.

Working Miracles

PC: Do you find you have a different attitude toward work—that you want to sit down at the machine as opposed to the typewriter?

NORMAN: It's a different attitude toward revision. I do love my work and I am quite equipped emotionally to handle the solitude of it, so it is always exactly what I want to do in the morning. I always want to go to work. But when I approached revision, it used to be "Oh, God, here we go. How little do I have to do to accomplish this?" And now, I look at it—it's really given me a sense of energy about revision, because I know that I can work miracles now in revision. Whereas before, all I could hope for was adequate solutions.

PC: So you don't subscribe to the old complaint that the computer will take over your work by forcing you to work its

way?

NORMAN: No. I find that the computer is the best working company in the world. I mean, it's an ideal collaborator because it shows me immediately what it is that I have done. I realize this is kind of anthropomorphic, but I think of it as a fellow

***I** REALLY
think the world comes
to me through my
fingers.*

worker. I think of the computer as "That's the brain that is writing it all down." And I do know that I have a very personal relationship to it. I think of it as the editor, and ascribe to it all kinds of human qualities.

For example, I find one of the most

entertaining WordStar commands is Ctrl-QF. Because I think of the cursor sort of hopping up and down—you know, "Here it is! Here it is! I found it! Look, it's right here! Now what?" And I know that's just me wanting company, wanting to have a human relationship instead of a mechanical one.

I definitely think of the spatial organization of the computer's brain, almost like a neighborhood, almost like an enormous office. Today we were talking about putting WordStar onto a disk emulator in RAM, and suddenly I realized as I was talking about it that I had created this other disk drive, this sort of invisible disk drive, that was located back deep in the heart of the machine.

But then, I think about my own brain that way. I mean, I do think about it as an enormous office. You know, there are people who sit in the tiny room in the back, and there are some folks who are up in the front taking care of press relations. There's R & D, and there's a basement with cleaning people, and all that. That's

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which I think some people do. I mean, their mind is a curious sort of helper, but I've always thought of it as just a magnificent machine. So to pair it up with an equally powerful machine that is capable of doing other things is not at all foreign to me.

Bad Command or File Name

PC: Communication—and the lack of it—between human beings is a major concern in your plays. How do you view communication between humans and machines?

NORMAN: I think there are some commands that have been created in the world of computers to compensate for what we do so badly as human beings. It's a recognition of some real failures of communication between humans, and in a sense, I can talk more clearly to the computer about certain things than I can in the world.

I mean, the primary example is "Bad command or file name," which is simply the computer saying back to me "I don't know what that is that you've asked me to do. I don't recognize it, I don't know what to do with it. I would be happy to do whatever you would like me to do if you will just tell it to me in a way that I understand."

Now, that situation arises among human beings all the time. Someone says to you, "Do you really want to go to the movies?" That is a classic example of "Bad command or file name." You don't know whether the person is trying to find out whether you want to go to the movies, or whether they're telling you that they don't want to go to the movies, or whether they are really interested in what you think at

all. It is simply a real sloppy command. And I think that's fascinating. One of the things I would like to do is think about that whole list of commands that way.

But I find that I tend to do the WordStar D command just in normal life. I mean, I will open a new file all the time. And I think, "I will just put this there." "Read-

ing in"—we do that in our experience. We will KR a previous experience into this moment and see how it affects us. We also KW—we save things for future use.

PC: The New York Times mentioned your knitting while the printer puts out copy and said "this juxtaposition of the technological and the homespun is a quintessen-

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tial picture of this artist." Is it?

NORMAN: Absolutely. But it was always true. I would be typing, and I would get up, and to rest, I would go play the piano. I really think the world comes to me through my fingers. I like the feel of the keyboard, and I also like the feel of the yarn and the needle.

Knitting is not quaint. Knitting is a string of knots, a character string, if you will. Knitting is a perfect demonstration of "the whole is greater than the sum of the parts."

Knitting is a binary operation, much like the computer. You just have these two stitches, combining over and over in vary-

ing ways. A sweater is simply a grid, with all the blocks filled in, much like a television screen. It is less variable once it's finished, but much warmer. I'm interested in how things work, and sweaters, comput-

ONE OF THE things the computer offers all of us is consistency.

ers, and conversations all work the same way—one piece of information at a time.

The Edge of the Universe

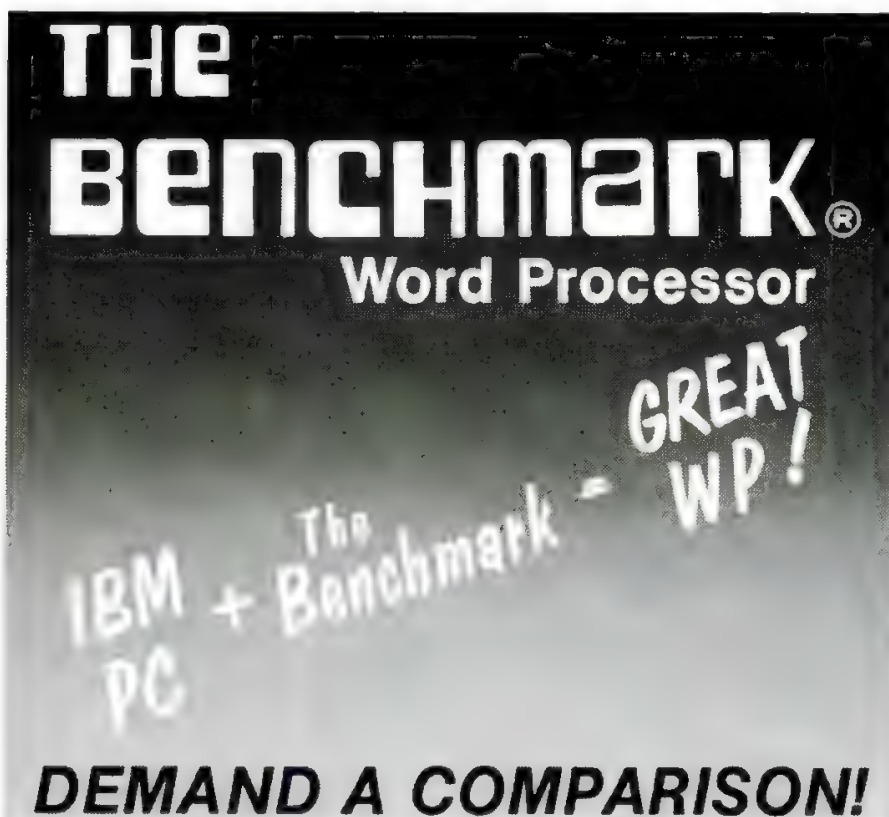
PC: Your first long piece was a book for a musical about inventors. Is that part of a technological bent?

NORMAN: It sure is. Take the zipper. It was invented by a fellow named Whitcomb Judson. It was the first unanticipated patent in something like 80 years at the patent office. When it arrived, there was absolutely nothing that preceded it. There was no way to predict that suddenly the zipper would come into the world. It was simply a guy standing there over his shoelaces one day, and saying, "There's got to be a better way to do this."

In the early days of Portapaks, I was a believer there, too, and spent three summers walking around the streets of New York with a Portapak, which of course weighs—God! And I was really interested in experimental video, and still am, although I don't really do much in it anymore. But I'm a real appreciator of what can happen an electron at a time.

I've said before that I'm most comfortable on the edge of the universe. That is really where I like to be. I am happy standing on the beach for that reason. I'm happy standing on the top of buildings for that reason. I just like the sense that all out in front of you is just open and waiting.

And that's how I feel about the memory of the computer. It's this great, vast blank space with nothing but power in it. All that is needed to make something of that is me. And I can come in and in a sense shape that inner world of the computer and say what's going to be there. I like that



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something-from-nothing. Which is how it looks to me when I'm seeing NEW FILE. I mean, it's very exciting. I know that a lot of writers have a fear of the blank page, whereas that to me is just thrilling.

Infinite Opportunities

PC: In 'night, Mother, Jessie talks about her loneliness as a child. Do you see computers offering kids a kind of surrogate friend?

NORMAN: Absolutely. I heard somebody talking the other day about a computer program that's been designed to help aphasiac kids. And thank God somebody is working there, because what those kids need is direct, immediate, consistent feedback in order to develop speaking patterns that don't exist naturally in their brains. In effect, you get sort of substitute circuitry, which would be thrilling.

I think that one of the things the computer offers all of us is consistency, which we miss so much in our encounters with humans. If I punch Ctrl-QF, I know exactly what I'm going to get. I'm never going to get "I'm too tired, I don't feel like it." I

never get anything other than exactly what I've asked for.

And I think that care in asking for the right thing and then finding that you get it back if you ask for it correctly is valuable in human learning. I think computers can teach a whole generation of kids that you must be very careful, you cannot eliminate a single step. A little mistake can undo hours and hours of work—and this

**I'M A REAL
appreciator of what can
happen an electron at a
time.**

is something kids have not known in the last 10 years.

And the computer gives infinite opportunities to do it right. This is personalizing again, but I feel the computer wants

me to get it right, and so is willing to allow me to try over and over and over and over again, and is in a sense encouraging me by its patience. Again, that's part of my peculiar, personal way of dealing with it, but it's very important to me.

PC: Jessie is isolated in so many ways. Do you have any fears about computers increasing isolation between human beings?

NORMAN: No. I think what we are seeing is exactly the opposite. Computer technology is allowing us to determine what our real needs as human beings are. Think of the medical advances, for example, that would never have been possible without the computer. It allows us to know things about our environment that were really invisible before, in the same way the electron microscope allowed us to see the atom. Now we can see what really is selling in a retail store or which chemicals are really affecting the course of a virus. And in every way the computer allows us to look more closely at our human environment, and asks us to be more human. We can use the computer as a tool for expand-

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ing our own humanity. I think that's exactly what's happening.

I have spent the last 2 weeks with the computer doing this revision of the Shaker project. I know that at 4 o'clock this afternoon the composer is going to come, we're going to have a conversation that casts a reading next Thursday at 1 o'clock, and then 17 people are going to gather in this room and read that play. That would not have happened without the computer. I simply wouldn't have been able to do it.

Now, that's putting me more in touch with my human world. I wouldn't ever have answered all my Pulitzer congratulation letters if I didn't have the computer to help me. So in a sense, I am in increased contact, because it's easier for me to be in contact.

I can even concentrate better. Before, when I would type for 4 hours, I would always end up being just blind from the noise, and now I find that's not true. I can even walk out of the room and it can finish up all the letters.

A Very Private Joy

PC: Do you find yourself wanting to spread the gospel according to IBM?

NORMAN: What's sad is that I have nobody to talk to about it. I did get through a period where I was a terrible bore about it. And I find that I am now able to stop myself after the first four sentences and

THE COMPUTER
allows us to know
things about our
environment that were
really invisible before.

realize that nobody in the room cares, so I can just shut up. Now it's a sort of very private joy. I mean, I know that I do love it, but I don't need to go sell it anymore.

PC: Do you find other people who have computers are generally the only ones interested in listening?

NORMAN: Yes. The other night, for example, I was at a party. It was a glorious party; there were wonderful people there, dear friends and people that I didn't know. And I went upstairs to go to the bathroom, and I came out and the host's son was waiting for me. He said, "Come on, I've got a PC in here," and he had a color monitor and he had Flight Simulator. Really, this dear boy had waited for me to come out of the bathroom to show me the color bars, and I was just thrilled. When we came back downstairs, it was almost like we'd been out in the back smoking: "Where have you two been? You've been up with that computer, haven't you?"

Portrait of the Artist as Hacker

PC: How did you go about learning BASIC?

NORMAN: Oh, it was just the most primitive approach. I read the description of

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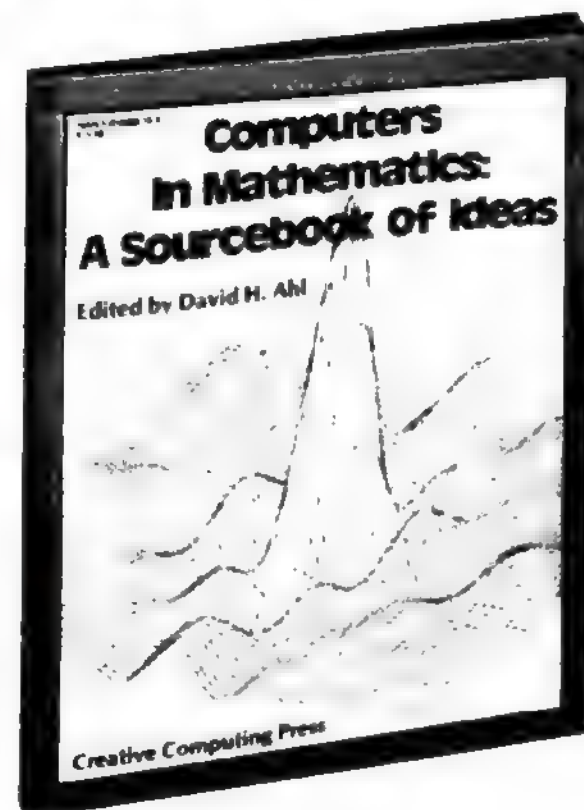
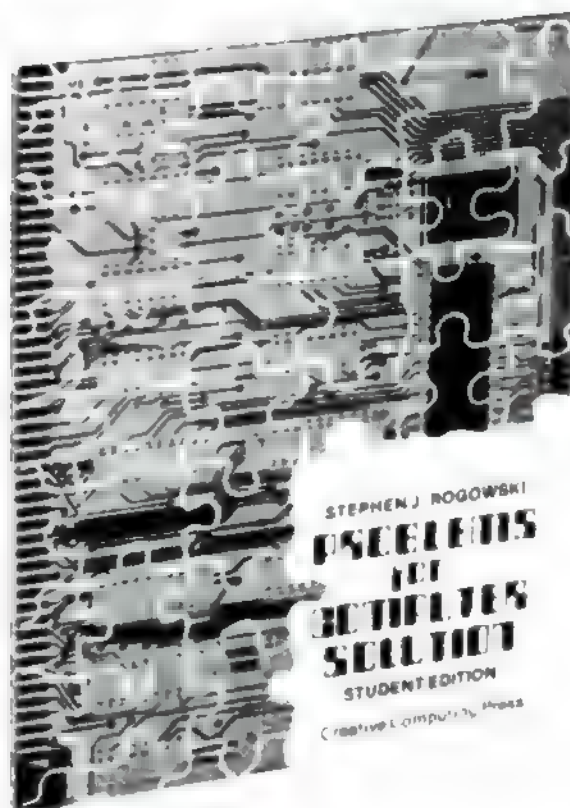
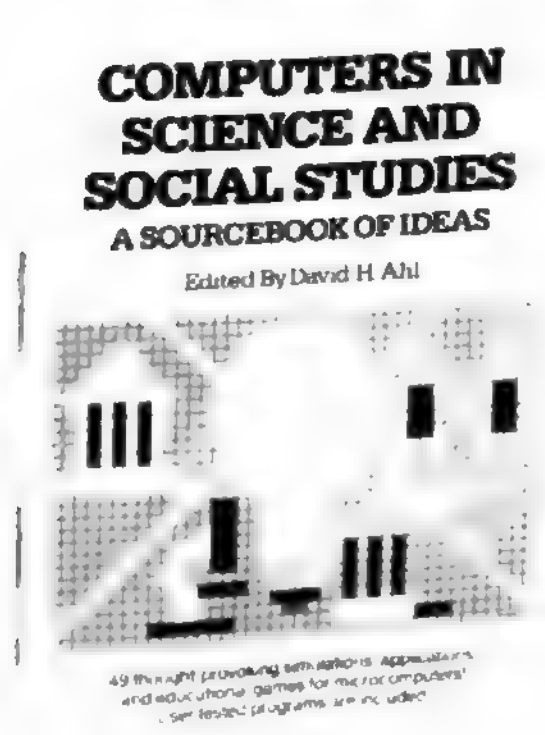
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the Play command, and, of course, I didn't understand a word of it. So I simply flipped back and forth through the BASIC manual, looking up the words I didn't know until I got it to work. And then I spent a whole day doing it wrong.

PC: The same with your typing program? You just hacked away?

NORMAN: A true hacker. You have to understand, this typing tutor's not very sophisticated. It doesn't say, "WELCOME TO DANN'S TYPING TEST" and then clear the screen. I mean, I didn't even know what "clear the screen" was.

I would really love to be fluent in BASIC, and I would love to have another whole life just to write language programs—books with looped episodes, and crossword puzzles, and who knows what else? The technology is just waiting for us to figure out what to do with it.

PC: Do you have any regrets or disappointments about the PC?

NORMAN: None that I haven't just taken care of with the memory. I found WordStar to be sluggish with just 64K. I really

didn't like the WAITs, and I really missed being able to go ahead and edit while I'm printing. I would like to have windows in WordStar. And I do hope soon there will

ONE OF THE things I think I wish I had is an absolutely silent printer.

be a portable version that's compatible with the PC and carryable, truly portable. I've looked at the Compaq, and I just know that I wouldn't be able to lug it around the world.

One of the things I think I wish I had is an absolutely silent printer. The other morning, I ran off a copy of the Shaker piece, and spent about 2 hours listening, because I was sorting my mail at the same

time. My ears were ringing for the rest of the day. I won't ever do that again.

I also have real complaints about the NEC ribbons. Somebody's got to make a better ribbon. I mean, I have a \$7,000 machine, and it does not produce as pretty a page as my old Electronic. And there are people like me who are willing to pay whatever a carbon film ribbon would cost. But NEC only makes this thing called a reusable film ribbon, and it produces this thick, old-style, nylon-looking print, and I am just not happy with it at all.

I am sure that there are probably printers that would produce what I want. I mean, clearly I get letters written on them all the time. But in this case it's simply a ribbon that's at issue. And I think that's probably a problem all through the industry—tiny little things that are really just aesthetic issues, but that ought to be considered, because there are those of us out here who care about them. I do think there's a point where the big companies need to call in people like us and say, "What do you need?"

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Computers and the Future

PC: Looking into the future, is there anything you'd really love computers to do?

NORMAN: Oddly enough, I'm not interested in voice-activated things. I don't know why that is, but that's probably some writer voodoo that's left over and I'll get over that, too.

PC: You don't want to dictate and see the words up there on the screen?

NORMAN: No. I would like for there to be some fabulous language programs. Those things—I mean, for Berlitz to go to programming—that kind of educational stuff I'd really be thrilled about.

PC: Your PC has appeared with you in the pages of *The New York Times*. How has instant celebrity affected your computer?

NORMAN: Well, I had expected Dattel to get my tractor feed to me once they saw my picture on the front page of the *Times* magazine. I would have thought that IBM would be interested to know that their product was of such value to somebody like me. I would have thought they would know that the real lasting cultural contri-

butions are going to be made by writers and artists using the machines. And that they should make them available.

You could make a major contribution to the literature of the country.

For example, one of the things that absolutely ought to happen is that the National Endowment for the Arts, in cooperation with IBM, ought to be giving word processors to writers. You could do so much good simply by giving the machines away. You could make a major contribution to the literature of the coun-

try; it absolutely ought to be happening.

I'm really thrilled to see big computer programs in colleges. In my home town, Louisville, Kentucky, they did a survey and found out that the greatest single benefit that could accrue to the community by any means whatsoever would be computer literacy on the part of students. And so the Humana Corporation, in cooperation with the Jefferson County schools, is doing two really intense computer programs in elementary schools. I mean, here you have a city that has decided that the best single thing that could happen to this city is computer literacy for its children. And that's magnificent, isn't it? But the truth is, it's just being realistic; it's just being practical. It is exactly what has to happen.

/PC

Editor's note: PC is happy to report that Marsha Norman's NEC 3550 tractor feed arrived by press time, along with a representative from Dattel who repaired her monochrome adapter bracket. Norman says she's "thrilled."

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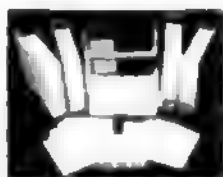
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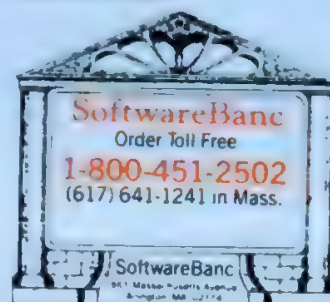
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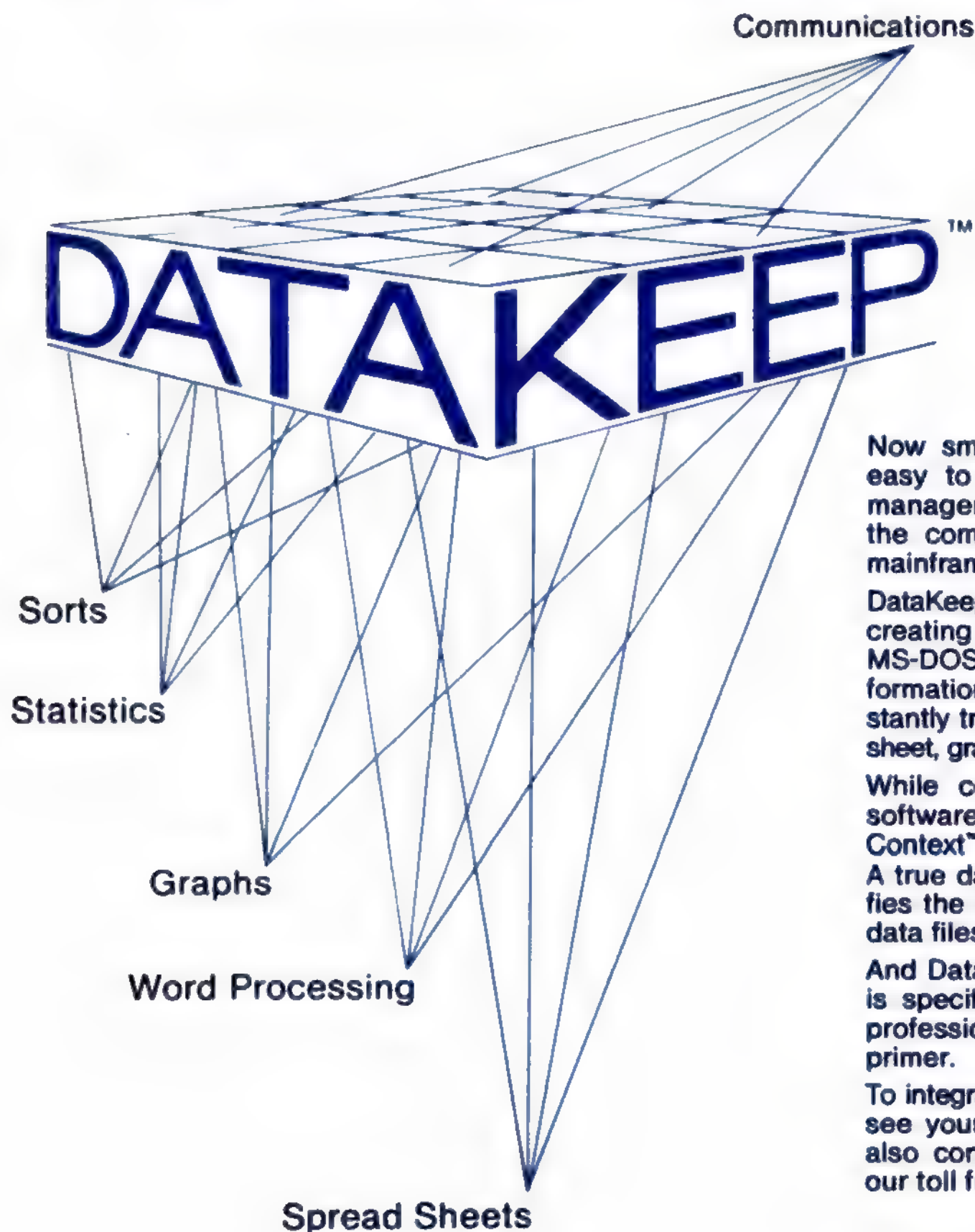
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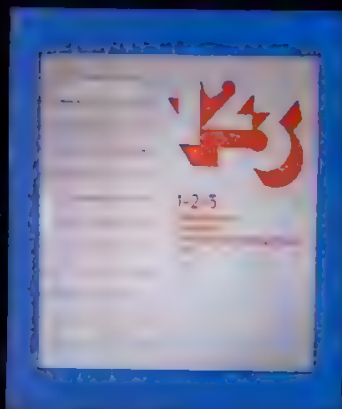
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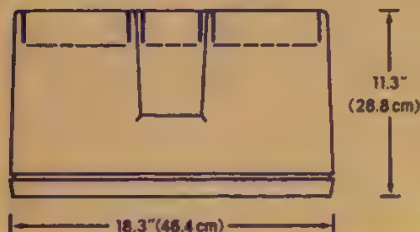
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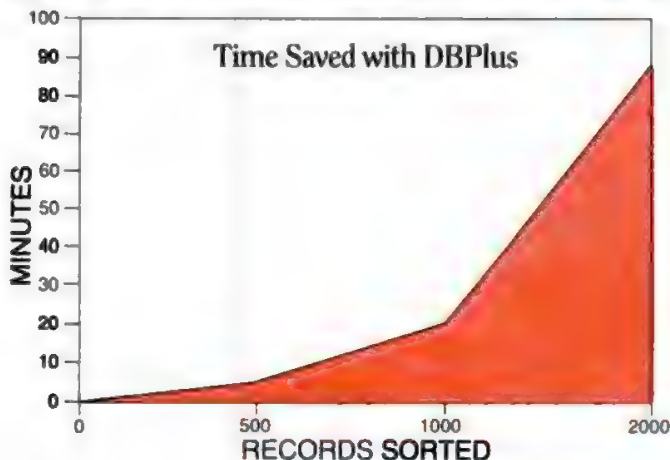
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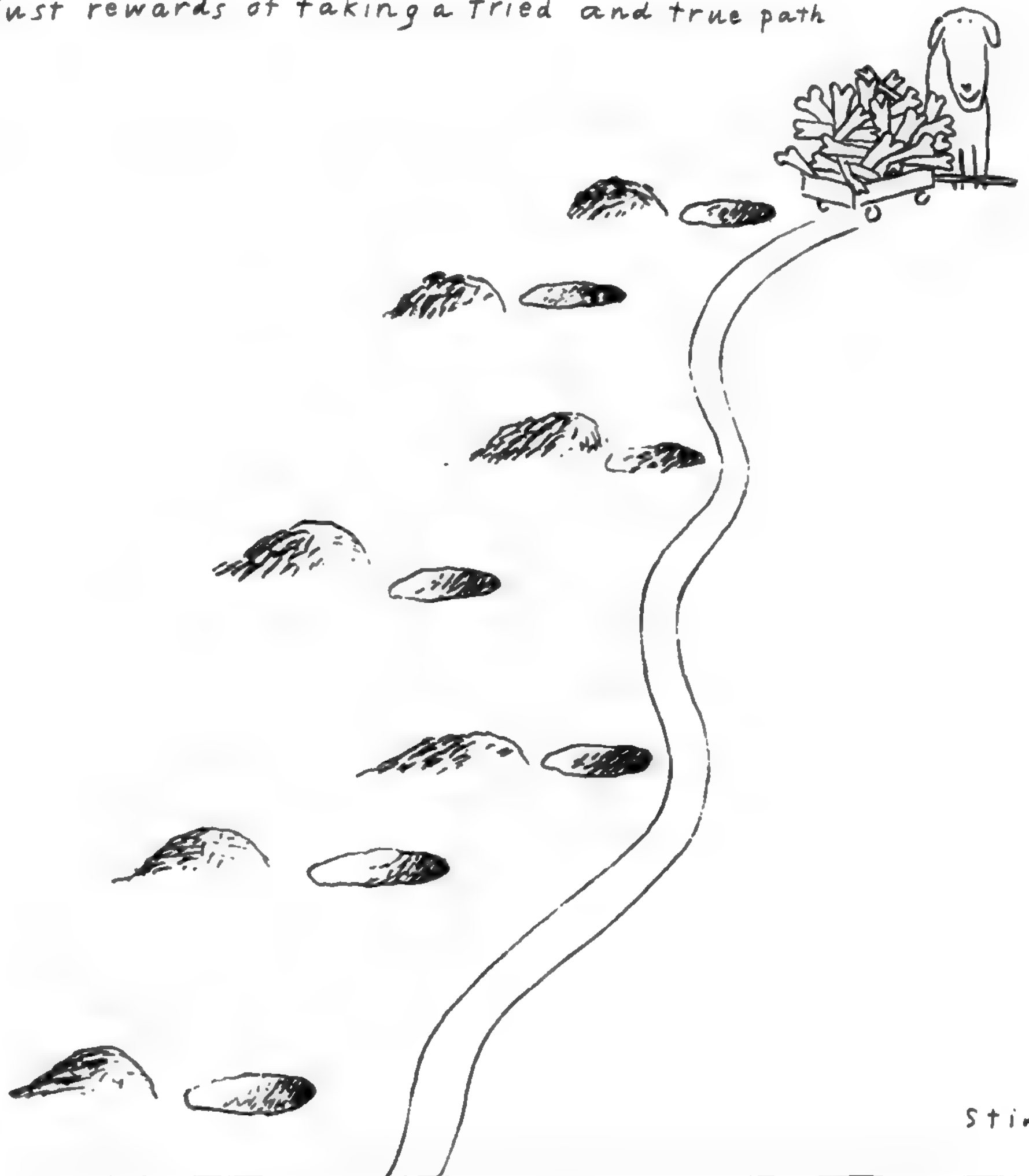
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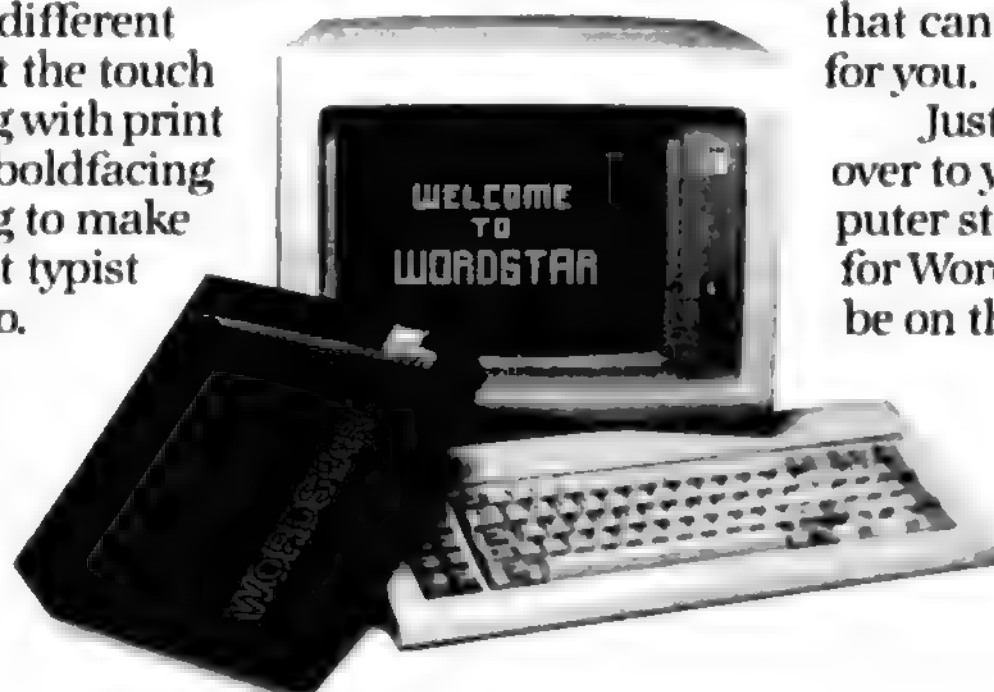
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Ashton Tate, the software company that brought us the best-selling database manager for the PC, dBase II, recently released a financial modeling program called *Bottom Line Strategist (BLS)*. In its present state, BLS is not likely to top the charts the way dBase II did. Still, the program is so slick, fast, and easy to run that it is with increasing regret that a user discovers how limited and how badly flawed it is. Updated versions are promised, which should correct some of these shortcomings.

Bottom Line Strategist is designed to do one thing: projections of the profitability of start-up ventures and new projects (see Figure 1). If you want to set up a computer-dating service, build a plant to make swizzle sticks, or just invest in someone else's venture, BLS will take the financial assumptions you feed it and predict the consequences. It does this by means of

sophisticated financial algorithms that are not supplied by the user but are written into the program itself. Unlike conventional electronic spreadsheets, which require the user to build each calculation into a template before the program will do anything useful, this one has a complex template already built in. All it needs is a

depreciation. Unfortunately, its Version 1.0 is guided by some wrong-headed assumptions about real-world finance, and it does a few tricks with taxes that would not amuse the IRS. Users who do no more than key in data and don't bother to study the algorithms before using the results may be in for some rude surprises.

USERS WHO
*don't bother to study
the algorithms may be
in for some rude
surprises.*

few values to plug into its international formulas before it starts spitting out numbers and plotting curves.

This is the way financial software for microcomputers seems to be headed—quick results and ease of use but with a loss of transparency to the user. BLS will calculate the net present value of a project before and after depreciation charges even if the user has never heard of "net present value" (NPV) and doesn't understand

Making the Model

To run a projection, you simply type in 31 Key Business Assumptions: the number values that the BLS model needs to evaluate a project. Input is a snap, since the entire program is menu driven (see Figure 2) and Help messages will flash on the screen if you don't understand the significance of an assumption (see Figure 3). These 31 numbers are the only information that can ever be fed into the program, so consider them carefully as I try a sample projection.

Let's say we are planning to start a business to assemble miniature portable TV sets. We will need to spend \$750,000 just to get started. That will include \$500,000 in tools, which we will depreciate in a straight line over 3 years and \$250,000 in other start-up costs. The development period, during which we expect to have no sales or revenues, should be 4 months. Fixed costs, includ-

ing rent, salaries, advertising, and other overhead, will be \$80,000 a month, and each TV set we make will require \$25 in parts and materials. We expect to price the finished product at \$100 and eventually expect to sell 4,000 a month. However, we can probably unload only 200 the first month and expect it will take 10 months before our monthly sales figures reach 2,000. We estimate our cost of capital (rate at which future cash flows will be discounted) at 25 percent and our tax rate—should we make a profit—at 50 percent (see Figure 4 for a full list of these assumptions).

Let's use BLS to see what our company will look like in 2½ years. We select a time frame of 30 months, type in A (for "analyze"), and BLS is off and running. It sends columns of numbers spinning down the screen, as it calculates monthly sales, revenues, costs, cash flows, asset book value, and net present value. When it is finished, it can print out neat tables that summarize this information (see Figures 5 and 6).

During the 4-month start-up period, we have no revenue—only expenses. BLS automatically splits our \$750,000 initial costs evenly over the period. Even after sales get going in month 5, we have a negative cash flow, because our low turnover doesn't allow enough

IN SPITE
of its speed and
attractive packaging,
the program suffers from
two kinds of serious
flaw.

profit to offset fixed costs. In month 11 we see a positive cash flow, and our net present value, which has been steadily sinking, finally changes direction. In month 21 we throw a champagne party to celebrate our positive NPV. From there on out, it's all gravy. These turning points are highlighted, and some of our assumptions are displayed in Figure 7, the BLS-generated Profitability Analysis.

Figure 1: A chart illustrating the financial model used by the Bottom Line Strategist.

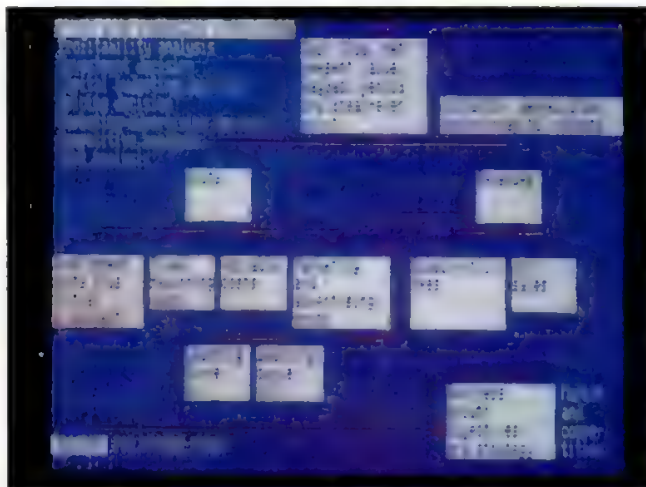


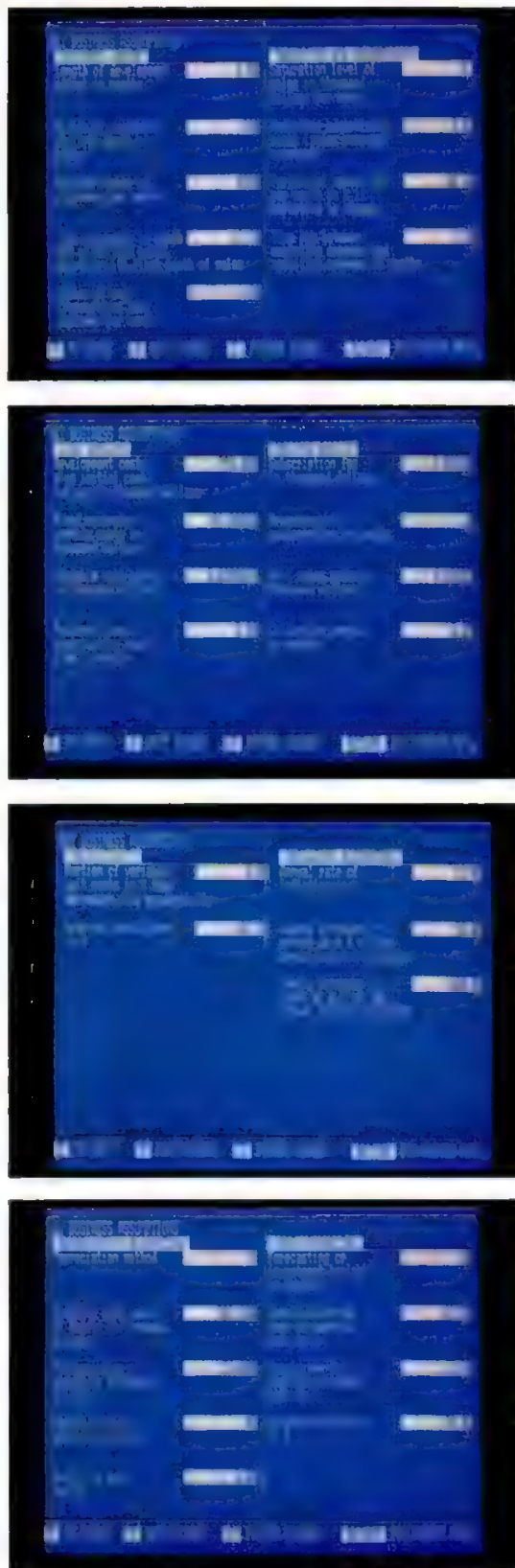
Figure 2: The Master Menu of Bottom Line Strategist.



Figure 3: One of the eight screens used to input the 31 Key Business Assumptions; this one is for values related to business growth. The Help key was pressed to display an explanation of the Length of Development.



Figure 4: A series of four screens displaying all the Key Business Assumptions used to model a new business venture.



One of BLS's flashiest features, though, is graphics. Once it has done the math, it can throw the results into snappy bar charts. It can take 11 different variables, such as sales, costs, or asset book value, and plot them against time. These can all be graphed as

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provision for ever
actually servicing debt
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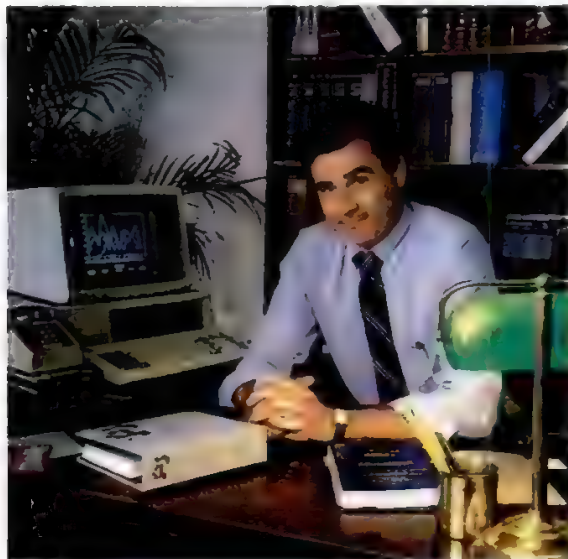
straight monthly data, month-to-month change, month-to-month percentage change, or monthly cumulative totals (see Figure 8). All graphs can be dumped to the printer, where they come out as somewhat less impressive curves rather than true bar charts.

For our miniature television company, we have graphs of total revenues (see Figure 9), cash flow (see Figure 10), and NPV after depreciation (see Figure 11). Units are in thousands of dollars. BLS has a nifty feature that lets you blow up any portion of any of the charts for closer inspection. For example, the second and third screens in Figure 11 show the data after zooming in on the break-even point around month 9.

So much for our escapade in manufacturing. If we had wanted, we could have fine tuned the projection by estimating the collection period if payment is not received at the time of sale, the production and distribution lead time for our product, and an expected inflation rate. Our model could even have incorporated an anticipated drop in variable costs, as our company moved out along the learning curve. Finally, for any given level of estimated sales, we could have calculated our budget for optimum marketing according to the Vidale-Wolfe model, if we understood such things as the saturation level of the market for miniature TVs, the time lag between advertising and increased sales, and the incremental revenue brought in by each additional advertising dollar.

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Time for a Reality Check

All this is very razzle-dazzle indeed, especially when BLS is run on a color monitor. Unfortunately, there is rather less here than meets the eye. In spite of its speed and attractive packaging, the pro-

USING BLS
is a little like shooting a
rifle. Once you let fly,
you have no control
over the bullet.

gram suffers from two kinds of serious flaws. The first kind is inherent to the program's design philosophy. No doubt both for ease of use and to simplify the coding job, the authors chose to construct a financial and marketing model in which Key Business Assumptions are fixed at the outset and may not vary throughout the life of the projection.

These assumptions can, of course, be changed if you start all over from the beginning. The same projection can be rerun in an infinite series of "what-if" cycles: How much do revenues increase if we can sell our TVs for \$115? How much longer until the break-even point if maximum anticipated sales are shaved by 10 percent? What will happen to NPV if development costs are cut by \$250,000 but the development period is stretched out to 6 months?

This sort of experimental tweaking is all fine and good, but using BLS is a little like shooting a rifle. Once you let fly, you have no control over the bullet. If the target is behind a tree, you can't make the bullet change course in mid-air and fly around obstacles. You can aim with care and fire thousands of rounds, but you will never score a hit. So it is with BLS. All your values are set at the beginning and cannot be changed. Subsequent versions of BLS should allow greater flexibility, but with BLS 1.0, projections are strictly line-of-sight.

For example, do you expect to buy additional machinery only as sales rise? You're out of luck. The model won't let you; you have to buy it all at the begin-

ning. Would you like to dispose of some equipment after it's fully depreciated? Out of luck again. In the model you can buy machinery but can't sell it. Do you expect borrowing costs to go down once sales begin in earnest? Too bad. Your cost of capital is fixed throughout the life of the projection.

Every one of the 31 assumptions you feed into BLS is just as rigid. Not a single value or tendency can be adjusted in mid-course. Inflation may not change during the projection. Sales may not drop—they must rise or hold steady. Perhaps worst of all, the tax rate is fixed forever, so you can't take investment tax credits or apply early tax losses to future profits—these are vital considerations in any start-up venture. The fixed rate also means you can't figure a tax holiday, anticipate a rate change, or shift brackets. Corporate tax rates are graduated, just like individual taxes, and the maximum rate of 46 percent

only kicks in after the first \$100,000. A new-ventures model should handle tax-bracket shifts, but BLS doesn't.

Financial Realities

Even more frustrating, though, are the second kinds of flaws; those that might have been avoided even with a model that cannot reset values. One striking but avoidable defect is the model's time-frame. BLS counts in months only and can count them no higher than 60. Although 5 years may be a long time in the software business, mineral extraction projects, for example, require projections of 10 or even 15 years. Many companies do not even do their sums monthly but break the year into quarters instead.

If need be, BLS can be fooled into doing quarterly projections by replacing monthly estimates with quarterly estimates and by multiplying all annual interest rates by 3. The results that the program thinks are

Figure 5: The Financial and Marketing report for the model company.

NOTION LINE SYSTEMS (TM) (C) 1982

ECONOMETRIC MODEL: BUSINESS, FINANCIAL AND MARKETING FORECASTS

Month	Number of customers	Number of transactions	Cumulative transactions	Total revenues	Marketing costs	Total costs	Cash flow	NPV before tax shelter
1	0	0	0	0.000	0.000	187.500	-187.500	-97.965
2	0	0	0	0.000	0.000	187.500	-187.500	-175.151
3	0	0	0	0.000	0.000	187.500	-187.500	-276.565
4	0	0	0	0.000	0.000	187.500	-187.500	-367.214
5	200	200	200	29.000	0.000	84.000	-55.000	-398.130
6	272	272	472	27.214	0.000	85.143	-57.929	-426.189
7	348	348	820	36.778	0.000	87.354	-50.576	-450.621
8	473	473	1333	47.239	0.000	89.852	-42.613	-470.480
9	652	652	1985	65.215	0.000	93.043	-27.828	-484.702
10	851	851	2836	85.086	0.000	97.017	-11.931	-472.070
11	1090	1090	3926	109.039	0.000	101.808	7.231	-491.401
12	1368	1368	5294	136.807	0.000	107.361	29.445	-481.649
13	1676	1676	6970	167.573	0.000	113.515	54.058	-462.000
14	2000	2000	8970	200.000	0.000	120.000	80.000	-432.448
15	2324	2324	11294	232.427	0.000	126.405	106.022	-373.087
16	2632	2632	13926	263.193	0.000	132.639	130.555	-314.765
17	2910	2910	16836	290.961	0.000	138.192	152.769	-258.709
18	3149	3149	19985	314.914	0.000	142.903	171.931	-226.328
19	3348	3348	23333	334.785	0.000	146.957	187.828	-197.090
20	3507	3507	26840	350.741	0.000	150.148	200.593	-166.225
21	3632	3632	30472	363.222	0.000	152.644	210.578	-14.973
22	3728	3728	34200	372.784	0.000	154.557	218.227	59.767
23	3800	3800	38000	380.000	0.000	156.000	224.000	135.260
24	3854	3854	41854	385.377	0.000	157.075	228.301	210.931
25	3893	3893	45747	389.348	0.000	157.878	231.479	286.426
26	3923	3923	49670	392.263	0.000	158.453	233.810	361.383
27	3944	3944	53614	394.392	0.000	158.878	235.513	435.608
28	3959	3959	57573	395.941	0.000	159.180	236.753	508.951
29	3971	3971	61544	397.065	0.000	159.413	237.637	581.387
30	3979	3979	65523	397.888	0.000	159.576	238.304	652.609

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monthly figures are then actually quarterly figures. This is a clumsy procedure, however, and prone to error; I wonder why the authors didn't allow a choice of monthly, quarterly, or annual projection periods.

Another mystery is why the program does not report net income. Somewhere within BLS, this figure must be calculated

for NPV purposes. While the user can graph such exotica as incremental marketing expenses or even contribution of depreciation charge-offs to NPV, he will look in vain for a simple statement of after-tax profits—a perplexing omission.

Worse than perplexing is the absence of any means to remunerate capital. The manual explains that cost of capital is cal-

culated by taking the after-tax weighted average of the costs of debt, equity, and retained earnings—a difficult and uncertain business, by the way. Then, quite properly, it uses this figure as the rate at which it discounts future cash flows. However, BLS has no provision for ever actually servicing debt or paying dividends.

In the real world, shareholders may sometimes have to wait for their dividends, but bankers get very nasty when customers fail to service their debt. A financial model that does not even permit interest payments, much less principle repayment, is gravely defective. One way to fudge a solution might be to include remuneration of capital as a fixed expense. Unfortunately, we are not allowed to have fixed charges until after the development period, which we could very well have financed with debt. Furthermore, interest payments are tax deductible, whereas dividends are paid after tax, and BLS can't tell the difference.

Furthermore, since cost of capital is so notoriously difficult to calculate, many small companies bypass it entirely when evaluating new projects. Given anticipated cash flows, they solve for the discount rate that will produce an NPV of exactly zero, a value called the internal rate of return (IRR). The higher the IRR, the better the payout. This way, a company that has only a hazy notion of its cost of capital can compare similar projects and choose the one with the highest IRR. This type of analysis has limitations, but there are hand-held calculators that compute this value, even for projects with variable cash flows. It seems a shame that BLS can't get the IBM PC to do the same.

BLS ASSUMES
that you are going to
break the law.

Another strange oversight is the lack of any opportunity to reinvest positive cash flows. Classic NPV analysis always assumes the businessmen are at least smart enough to buy Treasury Bills if they have cash lying around. BLS assumes nothing

Figure 6: The Depreciation and Tax Shelter report for the model company.

BOTTOM LINE STRATEGIST (TM) (C) 1982

ECONOMETRIC MODEL: BUSINESS, FINANCIAL AND MARKETING FORECASTS

Month	Book value of assets	Depreciation tax shelter	NPV before tax shelter	NPV after tax shelter
1	121.250	1.875	-92.965	-91.107
2	238.750	3.750	-185.151	-177.614
3	352.500	5.625	-276.565	-265.560
4	462.500	7.500	-367.214	-343.987
5	447.500	7.500	-398.130	-372.749
6	432.500	7.500	-426.189	-373.721
7	417.500	7.500	-450.621	-411.133
8	402.500	7.500	-470.488	-424.046
9	387.500	7.500	-484.702	-431.371
10	372.500	7.500	-492.070	-431.915
11	357.500	7.500	-491.401	-424.486
12	342.500	7.500	-481.649	-408.037
13	328.437	7.031	-462.088	-392.258
14	315.312	6.563	-432.468	-346.887
15	303.125	6.094	-393.087	-302.218
16	291.875	5.625	-344.765	-249.060
17	280.625	5.625	-288.709	-138.213
18	269.375	5.625	-226.328	-121.086
19	258.125	5.625	-159.058	-47.115
20	246.875	5.625	-88.225	26.374
21	235.625	5.625	-14.973	104.240
22	224.375	5.625	59.767	183.549
23	213.125	5.625	135.260	263.570
24	201.875	5.625	210.951	343.745
25	191.563	5.156	286.426	423.291
26	182.188	4.687	361.383	501.915
27	173.750	4.219	435.608	579.410
28	166.250	3.750	508.751	655.631
29	158.750	3.750	581.307	730.839
30	151.250	3.750	652.409	804.965

of the kind. It does allow you to input a value for the prevailing risk-free interest rate, which one would naturally assume is the rate at which cash-on-hand is to be reinvested. Well, it's not. *BLS* would even let extra millions lie idly in the till. The risk-free interest rate is only used to calculate NPV after depreciation charges.

Another bizarre feature of the *BLS* financial model is the way it handles inflation. It allows you to anticipate an inflation rate and even to allow sales revenue and costs to increase at different rates—a nice touch. Thus, you may decide that costs will increase at 120 percent of the annual GNP deflator but that you can get away with raising prices by only 80 percent of that figure. However, when *BLS* produces anticipated cost and revenue figures, they are not adjusted for inflation; they are the same numbers you get with the inflation rate set to zero.

BLS is not, however, ignoring inflation. If prices and costs are increasing at different rates, cash flow and NPV will be affected, and *BLS* correctly displays these new values. In other words, to arrive at inflation-adjusted cash flow and NPV, *BLS* has probably calculated inflation-adjusted costs and sales—it just doesn't display them. Why not?

Yet another unnecessary defect is the requirement that all capital equipment be depreciated identically. You can't break out 3-year machinery and depreciate it faster than 15-year real property. Nor can you set different salvage values. The *BLS*

ANYONE WHO
has seen how a
mainframe can run the
numbers is still likely to
think this program is a
toy.

manual claims, on page 110, that this restriction "minimizes detailed analyses . . . and tends to average out errors." (The italics are theirs.) Oh dear!

Finally, and quite spectacularly, *BLS* assumes that you are going to break the law. When you buy capital equipment at

Figure 7: This summary of results appears on the screen after all the calculations for the Profitability Analysis are completed.

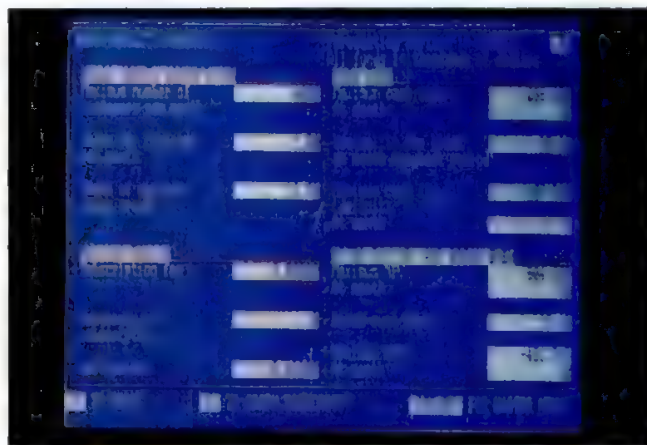


Figure 8: The Business Forecasts Graphics Menu can be used to generate bar charts of data calculated in the Profitability Analysis. On this screen the Total Revenue option (3) has been selected. The next keystroke will choose the range of value to be displayed in the chart; the options are listed in the lower right hand corner.

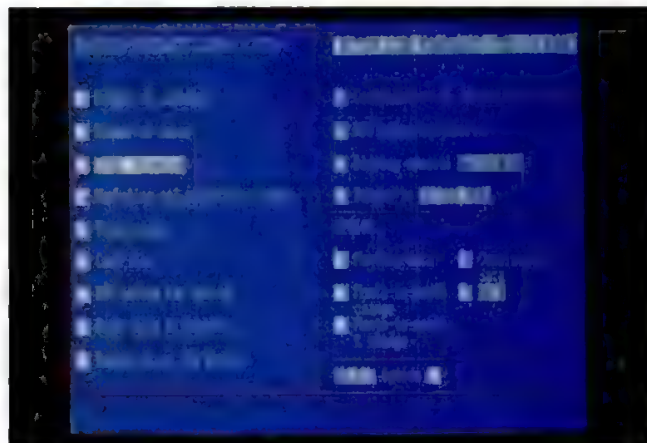
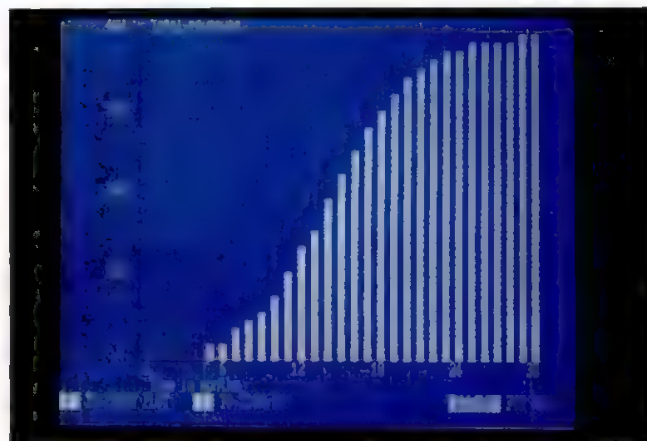
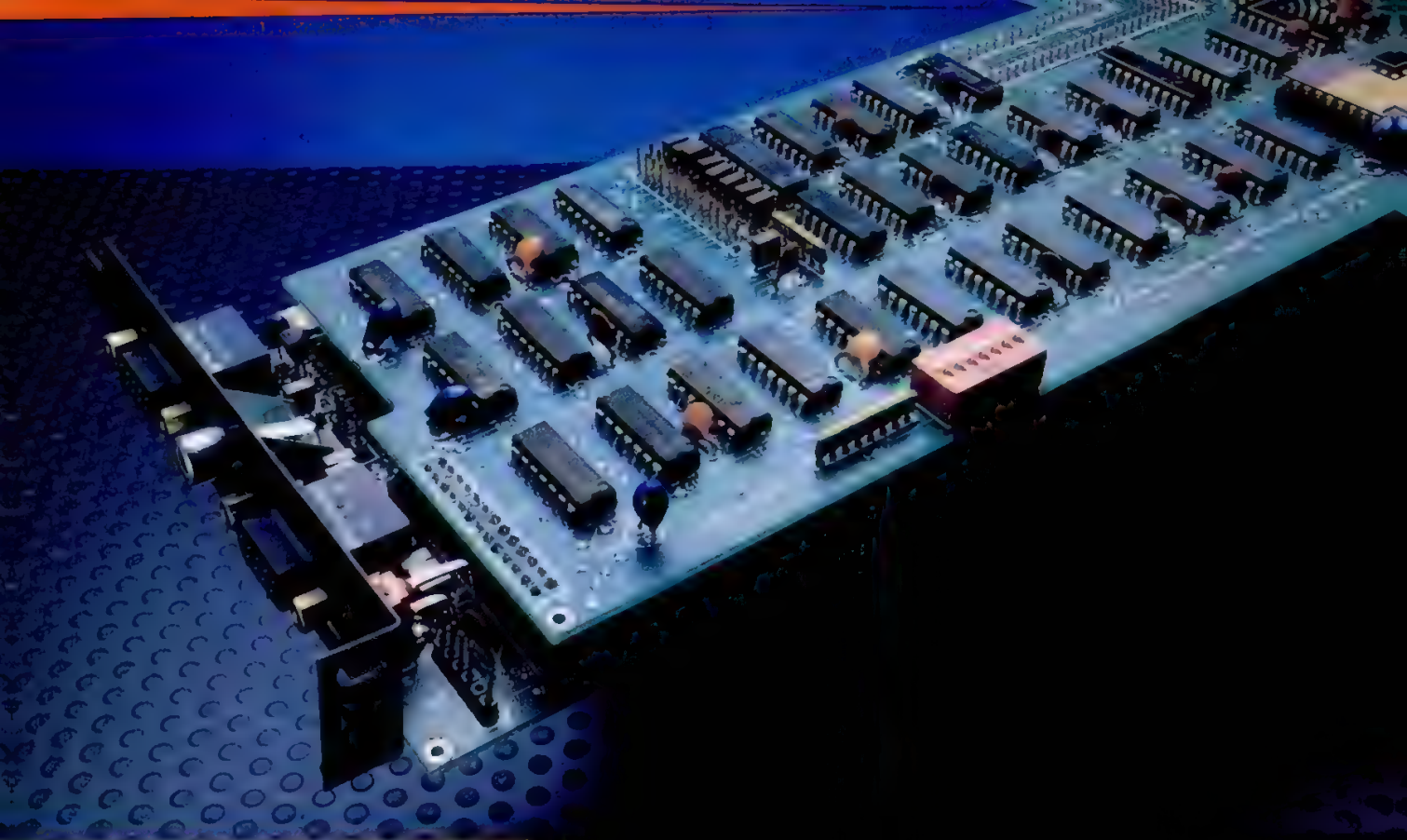


Figure 9: The screen display of a bar chart showing the monthly values of Total Revenue for the model company.





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the beginning of a project, it expenses the entire cost during the first month in service and then calmly proceeds to depreciate the equipment over its estimated useful lifetime. Now that really is a neat trick; if you actually try it you're likely to go to work one morning and find a United States marshal putting a padlock on the

door to your factory. This kind of monkey business would show up immediately if BLS reported after-tax earnings. Since it doesn't, it takes a little poking around in the financial algorithms to figure out what's going on. Surely Ashton-Tate doesn't endorse cooking the books, but its beta-testers seem to have been asleep at

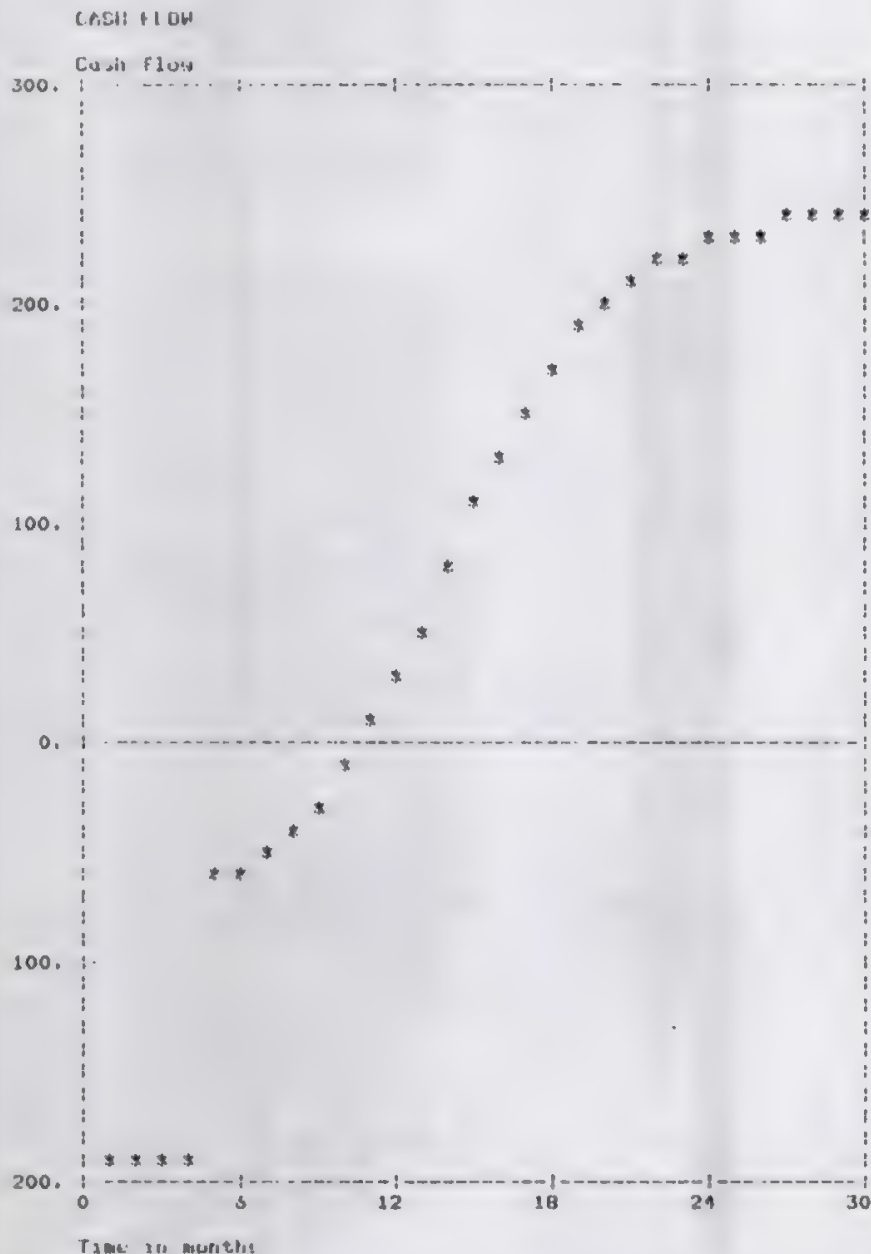
the keyboard on that one.

A New Model

Well, what can we expect from the soon-to-be-released *Bottom Line Strategist* for its screen displays.

THE BOTTOM Line Strategist is a box as black and as mysterious as an 8088 chip.

Figure 10: The printed version of the chart of monthly values for Cash Flow. Note that the graphics in this printout are less sophisticated than those generated by *Bottom Line Strategist* for its screen displays.



gist Version 1.1? One obvious improvement that the authors have promised is somewhat greater IRS compatibility—depreciable equipment will not be expensed. Version 1.1 should also be integrated with *dBase II*, so that data files can be transferred between the two systems. Ashton-Tate also promises some rudimentary spreadsheet capabilities that would permit additional values to be derived from BLS output. We might even be able to calculate net profits. The program should also make better use of the Epson printer's graphics, so we can expect true bar-chart printouts. Finally, it sounds as though it may be possible to add certain specific expenses and revenues at points along the projection path, but BLS 1.1 will be far from allowing us to reset values en route at will. Anyone who has seen how a mainframe can run the numbers is still likely to think this program is a toy.

Apparently, there is a Version 2.0 in the works even now, which should come closer to approximating the real world. It may be a while, though, before we can remunerate capital, reinvest positive cash flows, dispose of obsolete equipment, or take advantage of a tax loss carry forward. One of the authors of the program is right when he describes BLS as "an electronic back-of-the-envelope." Of course BLS does far more than anyone could calculate on the back of an envelope, but it cuts plenty of corners and suffers from limitations that are not immediately obvious.

Capabilities Versus Omissions

There's cause for reflection in all this. For most of us, computers will always be

mysterious black boxes, their inner workings a marvel. This is as it should be; what a microprocessor actually does to earn its keep is of no real concern to us. For those who don't understand finance and who haven't the time to learn, the *Bottom Line Strategist* is a box as black and as mysterious as an 8088 chip.

But software is different from hardware. It is vital that users understand the criteria by which a financial model evalu-

IN 1982
there were 25,346
corporate bankruptcies
in the United States.

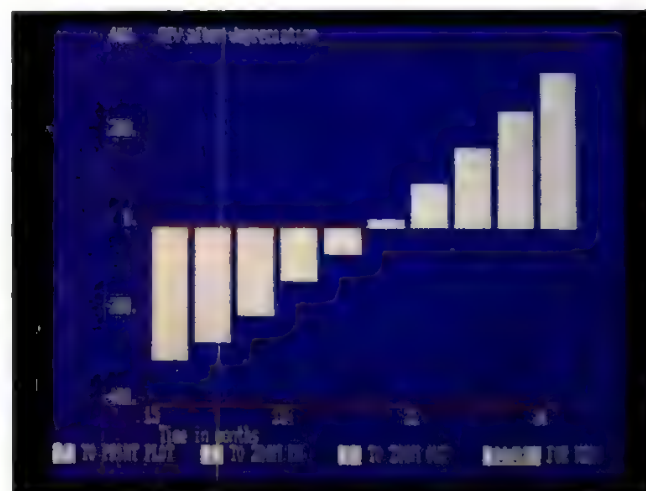
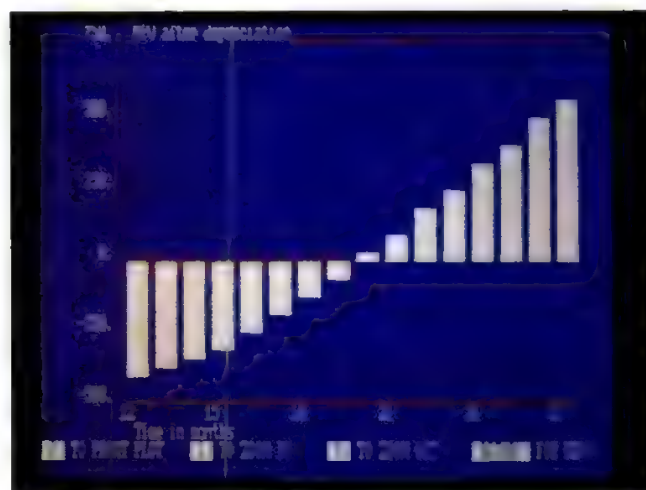
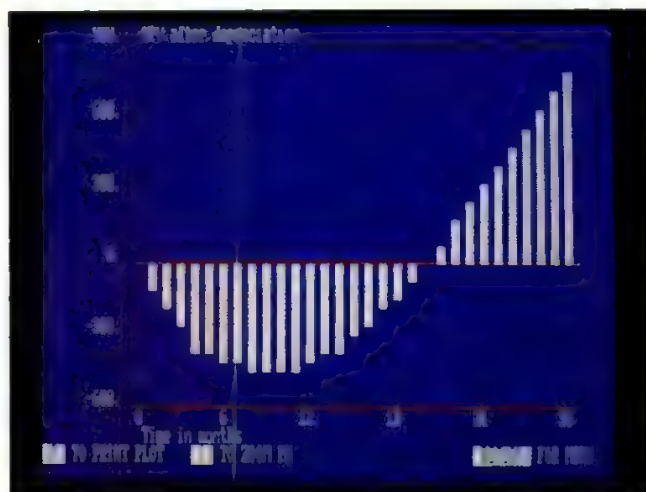
ates a project. As we have seen, the *Bottom Line Strategist* performs its wonders in mysterious and sometimes questionable ways. We shouldn't expect the BLS manual to teach us enough about finance so that we can figure out the model's limitations for ourselves. Nevertheless, we would be more honestly served if the manual included a sober list of things the program can't do rather than constantly congratulating itself on the things it can do.

So, what are we to make of the *Bottom Line Strategist*? The authors drop us a hint. "We invite you to explore the liberating and joyful world of strategic financial-and-marketing planning," they gush, in a lyrical passage from the first screen in the Executive Overview. Liberating and joyful? In 1982 there were 25,346 corporate bankruptcies in the United States. Maybe some of them were caused by managers who thought they wouldn't have to pay interest on their loans or who tried to depreciate equipment after they expensed it. It's a tough and dangerous world out there, and it's not easy to be sympathetic towards a program that trivializes the risks.

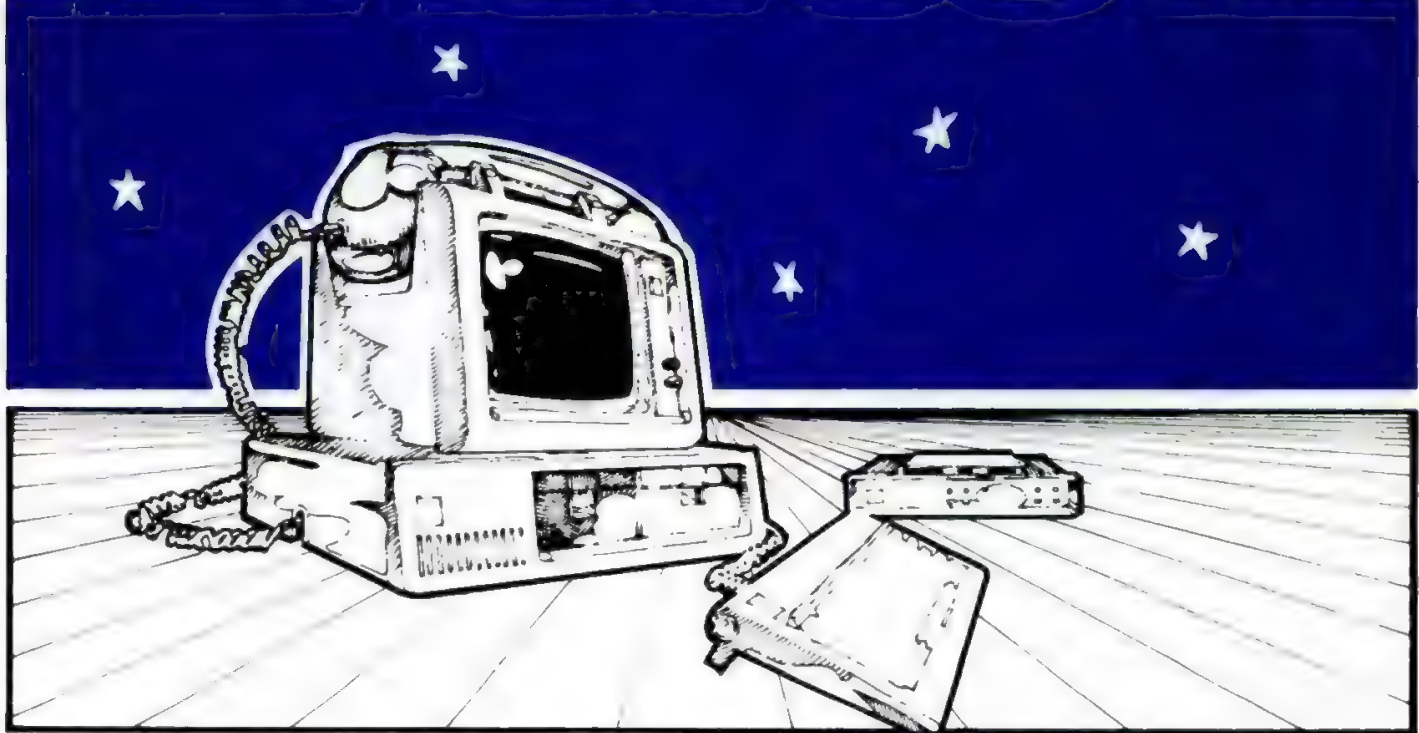
/PC

Jared Taylor is a former loan officer for Manufacturers Hanover Trust Company. He is also author of *Shadows of the Rising Sun: A Critical View of the Japanese Miracle*, which will be published this fall by William Morrow & Co.

Figure 11: Charts of the monthly values for net present value (NPV) after depreciation. The series of screens demonstrates the program's ability to zoom in on a section of any bar chart.



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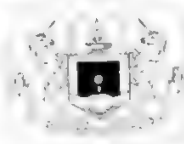
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List Price: \$8,150 for the complete system unit, including case and CCOS operating system

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What's black and beautiful and 15 inches long? And so crammed with futuristic electronic devices that it looks like something Luke Skywalker would use to destroy an evil civilization?

Picture this: Five captains of industry file into a lush boardroom; the deal they plan to cut will put a severe hiccup in this year's graph of the GNP. The first one points almost imperceptibly to a spot on the sleek Brazilian rosewood table as two aides scurry to disentangle a PC and its knot of cables from a dolly and set it up in front of him. The second hefts a Compaq to the work surface and pops the plastic keyboard noisily down.

The third unfurls a TRS Model 100; at the sight of the word "Shack" emblazoned on its case, the others in the room immediately dismiss him as a loser. If he were in

Japan he would commit hara-kiri on the spot to save face. The fourth deftly uncrates an IBM look-alike, and spends the next 10 minutes trying to get it up and running with a tall stack of IBM-incompatible floppies.

The fifth reaches for a thin, elegant attaché case, swings back the unborn-vicuña leather top, and slides out his Grid Compass. The others all drop dead. I mean, for \$8,150 they should.

THE GRID IS
the ultimate status
computer, a real head-
turner, the Bugatti of
bits.

Bugatti of Bits

The Grid is the ultimate status computer, a real headturner, the Bugatti of bits. Put one down in the middle of a DP crowd and from the ensuing buzz of appreciation you'd think Nastassia Kinski had just dropped in with her snake. At the last few

computer shows you could pick out the Grid booth instantly; it was the one that always resembled the IRT subway at 5:15 p.m. on a Friday.

Why all the fuss? It's a class act all the way. Other so-called portables fall into one of two categories. Some have full 80 × 25 character displays and adequate mass storage devices, but usually resemble hulking sewing machines, and are about as easy to schlep around. Most of the rest sport squinty 8-line liquid crystal displays that you have to angle properly to read, and have precious little permanent memory or storage.

Why aren't there very many true portables that will tuck neatly under your arm, give you bright 80 × 25 displays under any lighting conditions, and store a double-sided disk's worth of files in their bellies? Easy. Money.

The Grid's celebrated flat panel display alone is said to have cost its parent company \$700 a pop when the unit was first introduced; the price has subsequently dropped a bit. And the three little eggs of magnetic bubble memory tucked inside aren't cheap either. Neither is its miniaturized high-speed modem.

So while portables have been proliferating lately like bunnies, none can match

16 bits never looked so good. This elegant portable boasts an 8086, an 8087, dazzling graphics, unmatched communications hardware, and MS-DOS. It's very hot, in more ways than one.



the Grid's pricey innards. Or want to. After all, how many big spenders are going to plunk down more than 12 thousand clams for this sexy black machine and its companion hard/floppy drive. Virtually all the other vendors on the market are aiming low.

Tied Down

This wasn't the only reason most systems manufacturers weren't worried. Grid originally designed its computer to plug into a national network named "Grid Central." The idea was that an executive could toss his computer into a briefcase (and still have room for his personal papers), fly to a meeting, dial up the network, then pull in and send out his files from that remote location. The only trouble with this is that most computer users prefer independent operation to what industry-watchers have called "the telephone umbilical cord."

Grid finally recognized this, and in June made a partially-IBM-compatible MS-DOS available in addition to its own less common Compass computer operating system (CCOS). This development may save the company from becoming an

vide file transfer utilities that let CCOS handle MS-DOS data.

The Grid was originally designed to run under the company's proprietary CCOS operating system. MS-DOS and CCOS may co-reside in the Grid when it is running, but programs written under the different systems can't be stored together. Standard CCOS applications include a spreadsheet, database manager, word processor, graphics generator, and both DEC VT-100 and IBM 3101 terminal emulators. CCOS also supports GridBASIC, Pascal 86, FORTRAN 86, and PLM 86.

Navigation Aids

Most of the Grid's programs share the same set of commands. Compass calls this "Leveraged Learning," and it does tie all the programs together fairly well and



The Grid's full-screen analog and digital clocks. Note the sweep hand marking off seconds.

allow users to move from one operation to another quickly and almost automatically. You can boot up, leap headfirst into a spreadsheet, toss a few cells around, tap the keyboard once or twice, then sit back and watch as the screen fills with presentation quality graphs and charts. And it's just as easy to stroke the keys once or twice more and send your data to another Grid.

The idea behind Grid Central is interesting in a space-age sort of way. You can talk to another Grid user across the street via a mainframe located in Mountain View, California, if you don't mind the phone bills. You can talk to another user across the hall using an internal Compass Central table-top computer-cum-network that can splice together up to 32 Compasses and a host of shared peripherals. If you can afford it, you can even string together mainframes, printers, data banks, and dozens of individual Grid work sta-

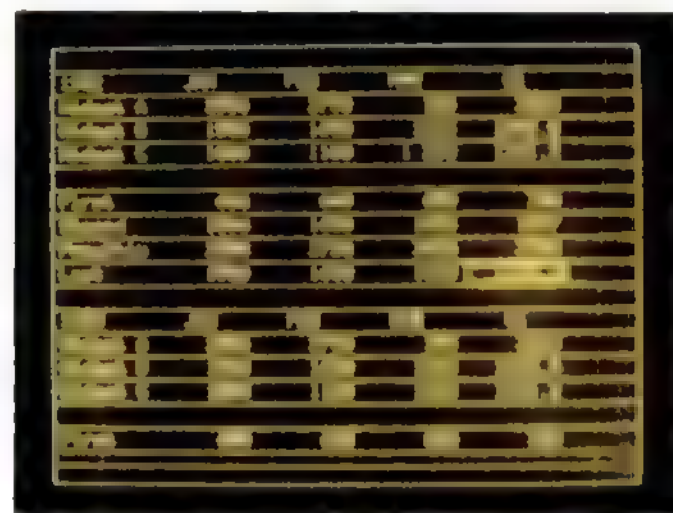
tions scattered across six continents.

When all the wires are in place, the whole network becomes the "Grid Navigator System." (Compass . . . navigator, get it? If this all sounds a bit confusing, it is. In fact, the folks at Compass are changing the

CLOSED, THE Grid looks like a lot of things, but a computer isn't one of them.

name of Compass Central to "Grid Local," which is only slightly less perplexing.) These guys are really on top of the micro world; their Compass Central box is built around Intel's next generation 80186 chip; in fact, each CC contains several of these chips to support centralized resource sharing and communications serving.

You have to admit, the idea is very sexy, conjuring up pulp-tech images: James Bond creeps into a telephone switching center in a steamy Jakarta jungle, whips out his Grid and twists a phone line into the back, dials a sophisticated SMERSH timing device on his screen, and defuses H-Bombs ticking down to zero in



Sample "Widget Alpha/Beta/Gamma" spreadsheet. Graphs in the accompanying reproductions are based on its numbers.

every Western capital. (Maybe this isn't so farfetched: One of the company's four regional offices is in McLean, Virginia—America's highest-tech spy city.)

And that's the feeling you get using one. One reason so many eyebrows go up and jaws go down when a Grid comes into the room is its styling. It screams expensive. The pixel-perfect bit-mapped 6-inch



Main Grid program menu. Programs are selected by moving a box up and down the list of choices using the cursor arrows.

interesting footnote in the history of microcomputer marketing, although many analysts feel its Tiffany price and selective marketing strategy may have the same effect.

Compass has already released DOS 2.0 versions of *MultiPlan* and *WordStar*, and will soon make available customized versions of *dBase II* and *Condor*. Microsoft BASIC is available in its interpretive and compiled flavors. Grid owners can also expect to see Microsoft's COBOL, Pascal, FORTRAN, and C, along with a Business BASIC compiler. And Compass will pro-

amber display with its lickity-split 66 Hz refresh rate, the sleek black magnesium case, even the way its knurled knobs click it open and shut, are all diabolically impressive. The thing drips with subliminal cues that whisper "take me home . . ." (or rather, "take me to your office . . .").

Under the Skin

And it's no slouch inside. Beneath its matte magnesium skin beats an honest-to-goodness 8086, not one of your garden variety 8088s that will soon be showing up in bins on Canal Street under hand-penciled signs that say "Any 4 chips \$1." The 8086 nestles against an 8087 floating-point prestidigitator. These two chips power a handful of dazzling sample Pascal plotting routines that flash across the screen so fast you think you're in graphics heaven.

The Grid's three bubbles can salt away

puter inside. Or for an executive who wants to sling one under his arm and walk through a tough neighborhood. Without the dangling power cord, and with the top down, it halfway resembles a trendy designer's silverware chest.

To operate it with MS-DOS loaded inside, you squeeze the knurled knobs forward and pry open what appears to be a large set of hippopotamus jaws at the business end of the unit. Press the rear rocker switch and you are greeted by a soft gurgle and the glowing orange message "Booting MS/DOS from b" on the otherwise dark screen. The B: drive in the configuration we tested stood for bubble. It's floppy was set up as A: and its hard disk as C:.

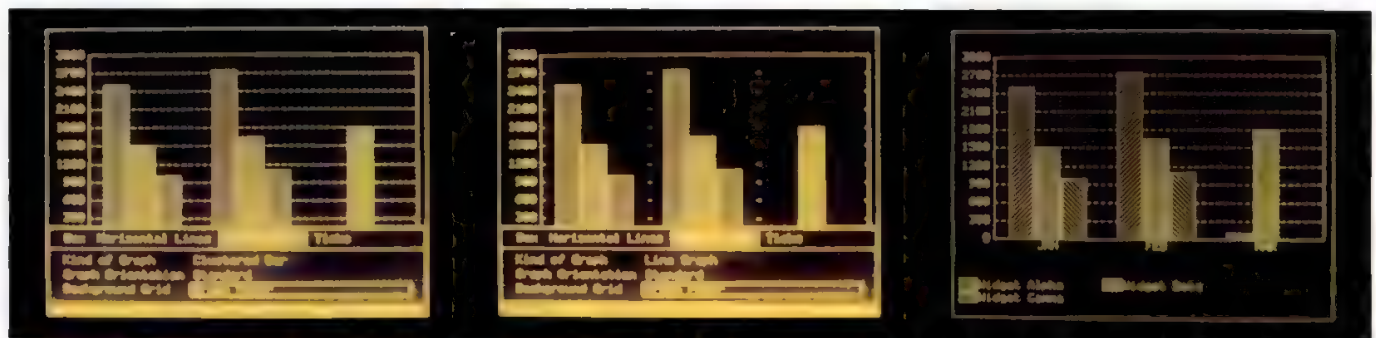
If the Grid is not connected to the floppy/hard disks via its IEEE-488 General Purpose Interface Bus (GPIB), the screen clears, then lists the attached devices, in our case:

guessed, the Grid won't run most PC software straight out of the can.

Diamonds Take Forever

The keyboard is decent—things are generally in the right place, although the numbers in the top row have to do double duty as function keys, and there is an additional control key named "Code." The four cursor arrow keys are in the upper right hand corner of the board, and are arranged in a diamond, both of which make life easy, right?

WordStar doesn't think so. Hit the cursor mover arrows and all you get are rows of brackets and capital letters. To use this version of WordStar you have to rely on the old-fashioned Ctrl-plus-E/S/D/X diamond. The Ctrl key is conveniently located at the extreme lower lefthand corner of the board, which means the little fingers of your left hand won't hit the shift key



Clustered bar graph with background of horizontal lines. Note grid menu in window at bottom.

Clustered bar graph with background of ticks.

Clustered bar graph in which menu has been removed.

384K of files, giving you more than a double-sided disk's worth of nonvolatile bytes at your fingertips. You also get 256K of RAM, a 300/1200 baud modem, IEEE-488 and high-speed (625 Kbyte/sec) peripheral buses, and a grab bag of other surprises, all wedged inside a chassis a mere 2-inches thick, 11½-inches wide, and 15-inches long. All this hardware throws off heat like a Franklin stove. In a pinch the underside of the unit could double as a Griddle; make mine sunny-side up. That's what happens when you cram a gadget-heavy PC into a package ⅓ its normal size.

Closed, the Grid looks like a lot of things, but a computer isn't one of them. This is good, I suppose, for the shock value when you flip up the screen and bystanders suddenly realize there's a com-

GPIB
Bubble
Floppy Disk [same as bubble]
No HardDisk
then, lo and behold, the semi-familiar:
MS-DOS version 2.00
Copyright 1981, 82, 83 Micro-
soft Corp.

Finally, it asks for the date and time and then sits there with a cursor unblinkingly tethered to a B> prompt.

From here on out it's pretty much straight by-the-books alien MS-DOS. Except for the fact that the letters are tiny, flat, and orange, you'd swear you were looking at a Lilliputian black IBM PC. Ours came with WordStar (version 3.3, no less, at a time when all you could get in stores when you asked for this was 3.24 and a blank stare). However, as you might have

half the time it reaches for the Ctrl, the way it does on the PC. Perhaps this is all because WordStar announces it thinks the Grid is a DEC VT-100.

WordStar on the Grid is so s...l...o...w. In a precision timing test performed with a wristwatch and an assistant, from the time my finger hit the Return key after typing WS, to the time the WordStar opening menu settled down on the screen, the Grid took a whopping 22 seconds, the PC a mere six. And when I loaded WordStar onto the PC's electronic disk, it took a lightning two. Everything else about the Grid's WordStar other than the speed at which text could be entered was equally slow. Is this what a busy executive wants?

To load files and programs into the bubble you can use either the GPIB line to

the disk drives or the modem. To boot off the floppy, you turn the whole works on and hold down the F key within 2 seconds of hitting the power switch. I would have preferred a menu that asked what I wanted to do and then did it real fast, especially since practically everything else is menu-driven.

When you boot off the CCOS floppy you see nothing on the screen for about a minute except a thin one-pixel border around the edge and a tiny block character semaphore in the lower right-hand corner. Then the date and time bang up along with a short menu. The date was correct, but the time was about 4 hours fast (7 hours fast by west coast standards). Ours was "Version 2.0.4 of Navigator Interface" and gave us two choices—Graphics or Programs. Interestingly, while CCOS can read the date and time from the Grid's lithium-battery powered clock, MS-DOS cannot.



Segmented bar graph.

You can't get to first base with MS-DOS until you either fill in the new date and time, or hit the Return key twice.

You make menu selections by hitting the appropriate cursor arrow key. Hitting the CODE+Return keys enters your choice. Each main menu selection leads to a higher-level menu. The first one the manual wants you to try is called "Set-Time," which turns the screen into a very classy nondigital clock, the kind with a round face and a sweep hand. If you are a true child of the computer age and don't know how to tell time from a conventional dial, there is also a small digital clock at the very bottom of the screen.

To find out what options each of the Grid programs offers, you simply type CODE+?, a very nice feature (except that you actually have to hit a third key, the Shift, since ? is uppercase.) This gives you access to another menu; hit CODE+O (for

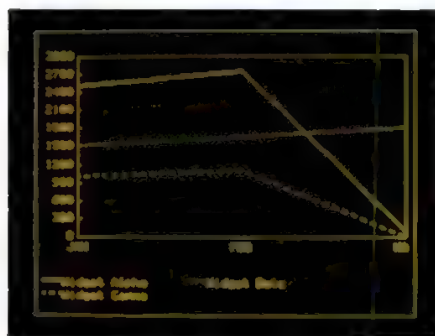
Options) and you can change the hour, minute, day of week, etc. One confusing aspect is that there is no menu selection to return to the main menu; you do this by "quitting" whatever you're doing. To the menu's credit, there is always a check to make sure you want to quit so you don't lose data by hitting the wrong key.

Tops in Plots

One of the things the Grid does best is turn its conventional spreadsheets (which it calls worksheets) into graphics. Its GridPlot utility is tops. With two or three keystrokes and a very simple menu you can tap out eye-popping bar charts, segmented bar charts, line graphs, and pie charts. It draws these charts and graphs in a flash, and the results are gorgeous. And there are some nice fillips: You can transpose elements to be plotted, lay them all down on top of different background grids, and switch between several kinds of graphic displays in seconds.

But GridPlot doesn't begin to tap the incredible graphics potential of the unit. Compass sent us six graphics demos that stop passersby in their tracks. The first is simply a screen of 13 or 14 little circles that explode like a rack of pool balls and bounce off the walls in effortless elastic collisions so fast and clean you'd swear you were staring at an animation on film or videotape.

Other samples give you a blazingly fast arabesque of twisting fractal geometry (called, oddly enough, "Hilbert"), a re-

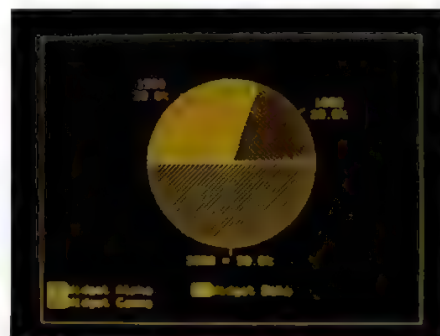


Line graph.

peating pointillist spray of loops and whirls, a hypnotic twirling phantasmagoria I can best describe as zooming wheels within wheels (stars actually), a spinning circular latticework web, and a magical dancing loom of swooping curvilinear planes at crazy angles that resembles a

special effect the U.S.S. Enterprise flew through once on its way out of a time warp. What makes these demos so remarkable and worthy of the gushing paeans above is their startling speed and the awesome spidery tracery of etched amber lines against the flat back screen.

The only software that comes with the basic package is the CCOS operating system and its Navigator package, and CCOS BASIC. If you want MS-DOS, you pay Grid \$150; for interpretive MS-BASIC, \$350; for the MS-BASIC compiler, \$395. According to Grid spokesman Andy Danver, you can't buy software anywhere else that will run on the unit. The word *discount* is not a part of the Compass vocabulary; the company recoils at the notion of selling either its sleek black machinery or its customized canned software at anything



Pie chart.

below list. So if you want MultiPlan, you fork over \$275; MS Pascal or FORTRAN, \$500; WordStar, \$495; dBase II or Condor, \$695; and MS-COBOL, \$750. I predict that Grid Systems will not sell an awful lot of COBOLs. You heard it here first.

Many purchasers do buy four of the most popular nine CCOS programs (which the company refers to as Management Tools), GridPlan, -Plot, -File, and -Write, at a special package price of \$940. The word is that some of this software—perhaps the four popular packages above—will soon be sold bundled with the hardware. Most of the other Tools are terminal emulators, which should sell moderately well, especially for the company's IBM 3101 package. A trim, rechargeable, 1 × 4 × 6-inch black battery pack will soon be available to keep the computer huffing and puffing away from its 120 volt lifeline for an hour. No price has been announced for this predictably popular accessory, which a Grid staffer described as "very

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appealing to executives—the size of a hip flask.” And Grid sells an adapter that plugs a Grid into, your car’s cigarette lighter so busy executives can make every spotlight count.

I Am a Camera

The editors at PC came up with an application that may generate interest among Grid users. Executives, it seems, are always looking for presentation-quality graphs and graphics in a hurry. For most, this means hiring expensive artists, or purchasing a separate image camera with its own flat panel CRT inside. Such cameras can cost \$8,000 or more [see “Screen Gems: From Monitor to Film” in this issue], and will produce images undistorted by the curve of conventional monitor displays.

We set up a 35mm camera in a darkened room, on a tripod about 15 inches away from the Grid, and made sure the film plane was parallel to, and centered in front of, the Grid’s crisp, pancake-flat, monochrome screen. We shot several rolls

of Polaroid’s instant 35mm Polachrome slide film, at ASA 40, with exposures bracketed between a quarter and an eighth of a second.

The results were sharp and impressive—and exceedingly fast. We were projecting finished images 10 minutes after we booted the computer. For businessmen who like dramatic visuals this can be a plus; they can have dazzling charts and graphs up on a projection screen minutes after working out the numbers.

High-Finance High-Tech

Grid Systems Inc. was founded by entrepreneur and former Xerox Advanced Office Systems Group Manager John Ellenby, who raised the necessary start-up money in two lightning attacks on Wall Street’s venture capitalists. Ellenby apparently convinced wealthy institutional investors such as Citicorp and the Mayfield Fund, and wealthy investing computer institutions like Gene Amdahl, to fund a high-tech venture that would assemble a portable executive workstation with the

best parts money could buy.

Executives were pictured as frequent travelers who liked to work on the run, and who would appreciate an elegant package they could carry home on week-

THE COMPANY recoils at the notion of selling either its sleek black machinery or its customized canned software at anything below list.

ends themselves. And, as one Grid staffer put it: “Business is a poker game. Style and status contribute to an executive’s authority and can help turn a borderline deal his way. And executives all believe that when it comes to expensive electronics, good things come in small packages.” Whatever Ellenby said seems to have worked; his investors put up \$13 million to get the ball rolling. It didn’t hurt that many of them also got a seat on the company’s Board of Directors.

The management raided Apple Computer, Hewlett-Packard, IBM, and Xerox to staff up. Engineers from HP cobbled together the basic hardware, and savants from Apple and Xerox its software. Ellenby’s most recent coup was to snatch Dave Hanna, former VP of IBM General Offices Systems. Hanna, now President and CEO, was tapped to “take Grid rapidly to the \$100 million milestone and beyond” in the words of Ellenby, who remained company Chairman. Hanna had been responsible for marketing IBM’s small systems, communications systems, and office systems to the nation’s 2,400 leading corporations. He had also been a nuclear weapons specialist in Vietnam. A word to the wise competitor.

Grid vs. Gavilan

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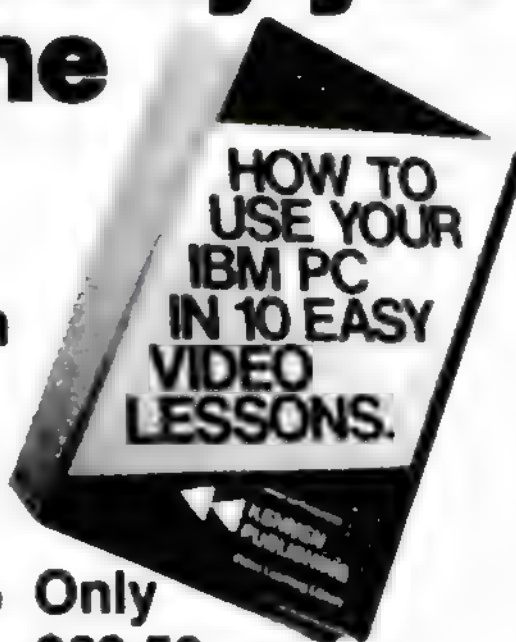
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George Moore, Product Manager at Gavilan Computer Corporation gives the Grid mixed marks: "The Grid's electroluminescent screen is a particularly elegant solution to the need portables have for a flat panel screen, and its packaging is generally very elegant. It has a very complete set of application software, and its graphics package is particularly good. The combination of bubble and RAM is larger than ours. It has an excellent communication package, especially its 3270 interface. And its 8087 is also a plus.

"But we believe that the Grid has several severe problems. It claims to be a portable but has no removable media. (The Grid, of course, hooks up easily to its own hard and floppy disk drives, as well as to any standard telephone.) Our unit has an integrated microfloppy. Theirs has a temperature problem. It still requires an umbilical cord whether the cable is tied to the Grid Central or plugged into a wall. The price of the standard Grid configuration is very high—and even higher when you have to run industry standard MS-

DOS programs. Their software is not truly integrated [Ed. note: Grid would dispute this charge], and they have nothing to match our solid state mouse, which Gavilan owners can use as a cursor mover or a selection device."

"Compass is right on the seam between the portable and the office market, and as long as they remain there, they will be unable to penetrate either market effectively." Moore may have a point, but the folks at Grid are finding ways to make the Compass both more portable and better suited for office work.

The basic Gavilan sells for \$3,995, and is truly portable. For half the price of a stripped-down Grid, you get a battery-operated computer with a recharger, 64K RAM (and 48K ROM) an 8 line × 66 character liquid crystal display (LCD), an RS-232 port, a built-in 3-inch 360K (formatted) microfloppy disk drive, a built-in 300 baud modem, and a video monitor interface (RF modulator). You also get the Gavilan's proprietary operating system, as well as its integrated word processor,

spreadsheet, asynchronous data communication package, and Portable Secretary (an organizer, scheduler, and tickler file)—and they throw in MS-DOS 2.0, an MBASIC interpreter, and a crushed velvet carrying case.

Or you can buy one fully loaded for \$6,225, which adds on the company's 985 printer (using thermal ink transfer tech-

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bouncy, cheery, well-
scrubbed, as if limned
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nology that Moore claims will allow letter quality characters on bond or thermal paper), a second floppy drive, and an additional 128K RAM.

The bare bones Grid, on the other hand, costs \$8,150, and for that you get the vaunted screen, 256K RAM, 384K of bubble storage, a true 16-bit 8086 chip and its floating-point 8087 coprocessor, a RS-232C and RS-422 interface, as well as an IEEE-488 bus, a 300 and 1200 baud modem, and the ability to hook into the Grid network.

Grid's combination 5¼-inch 10-mega-byte Winchester and 5¼-inch double-sided floppy will run \$4,100. Its floppy drive alone weighs in at a budget-busting \$1,195, but can fit in a large briefcase along with the system unit itself. The basic Compass Central file server to hook up eight of these together on a single multi-drop line will run you \$5,950. Everything the company stamps out has the same sleek, gorgeous, slimline look. And it all stacks up like the costliest miniaturized component stereo system.

Absolutely, Positively Broken

When the Grid was first announced, Compass planned to sell directly to Fortune 1000 companies and government accounts, and forego the normal retail channels. Sales were ... modest. The company recently launched a national retail marketing program, through status-conscious chains such as Businessland,

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Computerease, Simtec, and Computerworks. Compass executives claim they are now selling "several hundred per month" and are "very pleased at the 50 to 100 percent growth per month."

One problem about buying through a dealer is that you won't be able to sign up for Grid's unprecedented service contract. Costing about 1.5 percent of the total system purchase price, Grid's own service will guarantee a working machine in your hands within 24 hours of your panicky call. It does this by maintaining a supply of loaners at the Federal Express nexus. The Fed Ex man shows up the next morning with a new computer and takes your broken unit away, even if you live in a yurt in the Montana outback. Buy from a dealer and you get yours fixed by the dealer.

Either way, once you're a registered Grid owner you can call Compass's Mountain View customer service hot line from 6 a.m. (California time) to 6 p.m. and have some of the friendliest telephone service people in the business step you through a problem. From this end of the connection

they all sound bouncy, cheery, well-scrubbed, as if limned by Norman Rockwell. They almost have to be, since many purchasers are company presidents who don't want to hear a snarling moron tell

MANY
purchasers are company
presidents who don't
want to hear a snarling
moron tell them to read
the manual.

them to read the manual. You can also buy software from the main office over telephone lines; you simply yank the wire out of the back of your trimline, snap it into the Grid, and you're in business. If you need a program in a hurry, this is hard to

beat. The manual, of course, comes later.

Dozens of chief executives are taking the plunge. After all, if you have the money, why not get the best, and for quality of construction and design, and general performance, this computer beats the other portables hands-down. So are well-to-do professionals attracted by its sexy looks, and jet-hopping financial types who appreciate the 8087 they can plug in on the Eastern shuttle or the red-eye Washington Metroliner. And there are many other satisfied customers, including a metropolitan police force that uses Grids to file on-the-spot reports.

Truly Seductive

What does this all mean? The Grid is a superlative piece of engineering and styling. It would look good on a bare \$20,000 desk. In fact, it would make the desk look better. Every one of its features is kid glove quality. For certain complex numerical and graphic applications it wipes up the floor with the competition, including IBM. And its communications abilities are hard to beat.

Grid is making changes. It plans to offer an updated version with very large scale integrated circuits (VLSI) that will beat the heat. The new Grid may come bundled with some of the spiffier software available. And the company is working to expand its product line.

There's no doubt about it. The Grid is a phenomenon. Crowds formed immediately wherever I switched it on. Computer mavens were awestruck by its graphics, its size, and its nonpareil chips. Computer illiterates were just plain dazzled. It could stand a bit of tinkering, so you could put it on your lap and not burn a hole in your worsteds, store a bit more in an additional bubble or two, operate it longer without the umbilical to the nearest wall, and speed up some of the slower initial operations.

Ok, so it has a few drawbacks. But it is a truly seductive hunk of precision machinery. A nice piece of work. I hate to beat the car metaphor into the ground but the comparison is apt: It really does remind people of a prestigious, streamlined, hand-tooled European sports car. It's nimble, gorgeous, responsive, very sexy. And it really moves when it's in the right hands. Don't get me wrong, I'm not complaining about my PC. But if someone offered me a Grid I'd snap it up.

/PC

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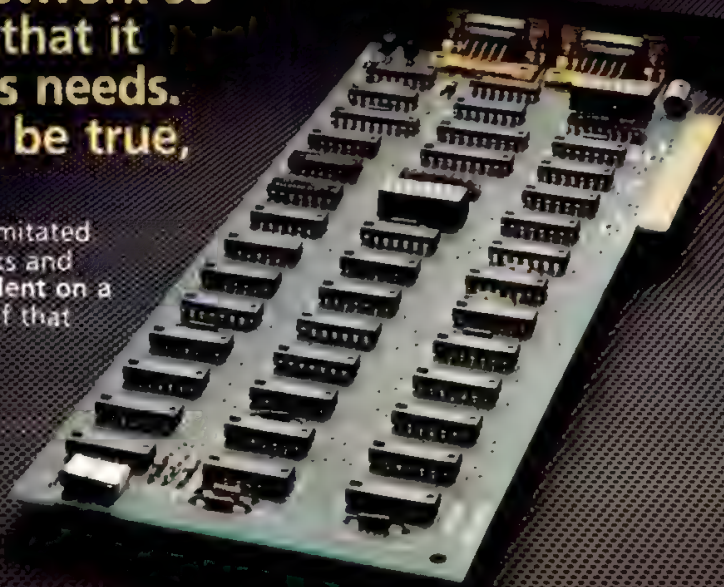
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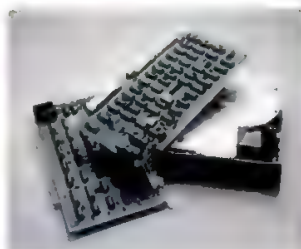
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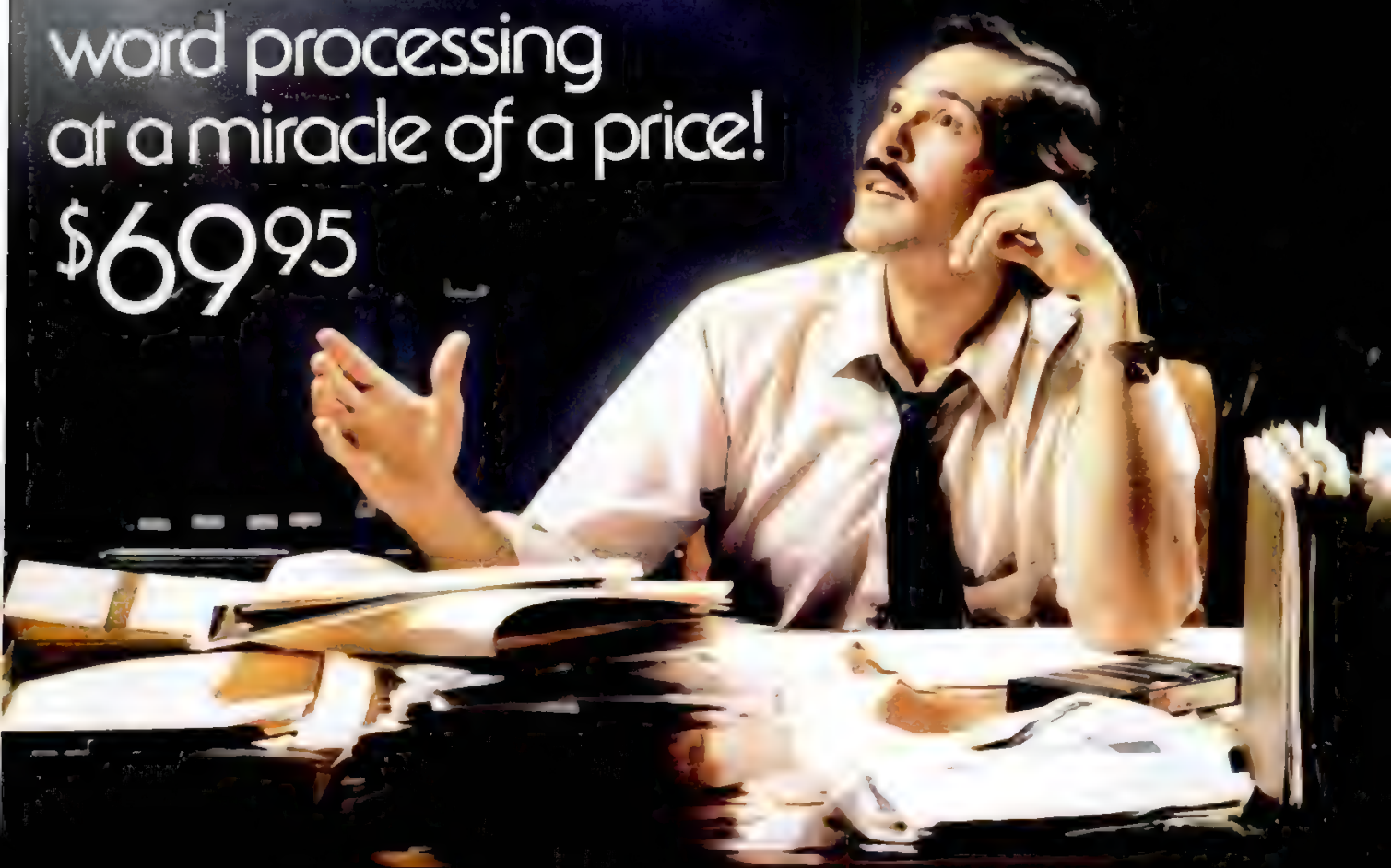
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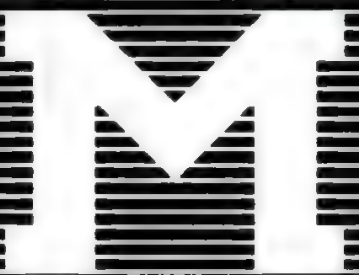


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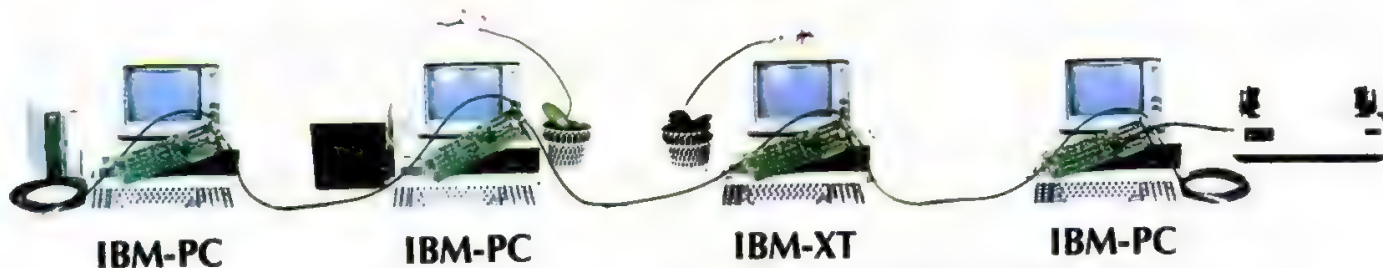
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CIRCLE 411 ON READER SERVICE CARD

When ordering, please specify both the computer/operating system and the hard disk/version. Orchid supports many different combinations and is adding new configurations each day.

The Eagle PC is a new PC-compatible with attractive styling, quality construction, and a useful set of bundled software.

Eagle Has Its Eye On The PC

Eagle PC

Eagle Computer, Inc.
983 University Avenue
Los Gatos, CA 95030
(408) 395-5005

List Price: PC-E with 64K, keyboard, one 320K disk drive, \$1,995; PC-1 with 128K, and additional high-resolution monochrome monitor, MS-DOS, CP/M-86, Eaglewriter, Eaglecalc, \$2,995; PC-2 same as PC-1 but with two disk drives, \$3,495; PC-XL with 128K, 10MB hard disk, one 320K disk drive, no monitor or software, \$4,495.

CIRCLE 695 ON READER SERVICE CARD

In the past few months many "PC-compatible" computers have come on the market, some of them from manufacturers that seemed to appear out of nowhere. Compared to these, Eagle Computer, Inc. has a long history—this company has been around since May 1982. At that time, it introduced the Eagle II, a Z-80 microcomputer that ran CP/M. At the end of 1982, the manufacturer introduced the Eagle 1600 product line: 16-bit micros based on an 8086 chip that ran at 8-MHz. These machines happened to be IBM PC-compatible, but their greater power and higher price tags (systems including hard disks ranged from \$4,495 to \$8,995) put them out of direct competition with the PC.

Now Eagle Computer has introduced a computer that's explicitly aimed at the



The Eagle PC, a nicely styled computer that's compatible with the IBM PC, is supplied with Eaglewriter and Eaglecalc software.

IBM PC's market, it's called, of course, the Eagle PC. It is available in four configurations: the stripped down PC-E; the PC-1 with a monitor, one disk drive, and software; the PC-2 with an additional disk drive; and the PC-XL with a 10MB hard disk, a floppy disk drive, but no monitor or software.

The model I tested was the Eagle PC-2. To offer more appeal than mere PC-com-

patibility, Eagle bundled CP/M-86 with this machine, as well as MS-DOS. Sharp styling is a major concern in the computer's design. To achieve its dramatic looks, the Eagle contains some of the newest and best components now available. For instance, TEAC half-height drives are designed as part of the standard model, as is the latest Keytronic low-profile keyboard.

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This is not a complete list and you may have questions not covered in this material — give us a call! We will address them and send you a brochure.

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Forth Technology

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CIRCLE 239 ON READER SERVICE CARD

Inside the Eagle

A quick review of the machine's specs tells a lot about it. The processor is the familiar 8088 running at 4.77 MHz. The system board comes with 128K of memory (the stripped down PC-E model only includes 64K) and has room for a total of 512K. The first 128K is soldered in; sockets are provided for the remainder. There is a socket for an 8087 coprocessor and the board comes with two serial ports in addition to the obligatory parallel port. To ensure IBM compatibility, the large-scale integrated circuits (LSI), such as the counter/timer and DMA controller, are the same chips as used in the PC.

Is a machine that suddenly stops really any better than one that makes a few errors in passing?

My first strong impression of the Eagle came from the quality of its construction. The enclosure is beautifully designed, of thick aluminum panels, perfectly finished. Care obviously went into the design of the case. There is a hinged cover on the right rear side that gives access to the connectors for peripheral devices. A small magnetic latch holds it in place, but don't worry about this magnet damaging your disks. About the only way you could hurt a disk would be to hold it against the magnet by catching it behind the cover.

There is also a hatch, accessible by removing five small Phillips screws, on the bottom of the machine through which you insert expansion boards. That's right: you put boards in from the bottom. The Eagle is built "upside down" compared to most other personal computers. The system board runs along the top of the case, with the integrated circuits facing down. The disk drives and power supply are mounted on the bottom of the case to form the "floor." There is nothing wrong with this approach, it's just unconventional. The open base of the machine gives you storage space for the keyboard.

The designers of the Eagle must have

decided early on that the typical purchaser would not need much in the way of expansion, since there is only one slot available on the system board. The other two slots contain the floppy disk controller and the monochrome display. Since the system already has two serial ports and room for 512K of RAM, there is some justification for this design. Still, having only one more slot feels constraining.

The memory is not parity checked; given the reliability of modern memory chips, I don't view this as a particular problem. The fail-safe approach (i.e. if there's a parity error, the machine halts) taken by IBM and other manufacturers is laudable, but unnecessary. It's only a stop-gap on the way to full error-correcting memory. Since these machines are not generally used in critical applications, such as life support and machine control, they can withstand an occasional memory error. Besides, is a machine that suddenly stops really any better than one that makes a few errors in passing? Without parity, the Eagle lets the user find out about memory problems in the usual ways: memory tests, program execution errors, and mangled words in your documents.

The main printed circuit board is a beauty. Premium construction techniques and materials were used throughout. All unused portions of the board are covered with copper ground plane instead of being bare fiberglass: this is a design technique I prefer. The firmware is contained in two 2764 chips (8K by 8 ROMs), with room for two more on the board.

There is no fan in the Eagle; but heat buildup does not appear to be a problem. There is no pilot light on the machine. Since it is dead quiet in operation and the monitor can be switched independently,

*THE KEYBOARD
is basically Selectric in
layout.*

it is easy to inadvertently leave the machine on.

Keyboard and Disk Drives

The keyboard is yet another variant of Keytronic's Soft Touch line. It's basically

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CIRCLE 373 ON READER SERVICE CARD

Selectric in layout, with cursor control keys, the IBM-compatible "extra" keys, and 24 function keys arranged tightly around the main keys. The typing field is a lighter color than the rest, but there are so many keys staring up at you that it's next to impossible to position your hands instinctively for touch typing.

Speaking of which, this keyboard has a noticeably shorter stroke than others. It uses Keytronic's trademark—the two-level spring. That is, the first half of the key's travel is opposed by a light spring and the second half by a stronger spring. The difference between the two is supposed to provide tactile feedback. This particular keyboard uses springs that are too light, especially the first set for short travel. Also, the switching or contact point is too close to the top of the stroke. The result is that the keyboard is subject to "teasing," inadvertent actuation of a key when your finger just barely touches it. The Control key tended to hang up in its actuated state: I had to give it a good rap every now and then to free it. Following the old adage that you can get used to anything, I continued to use the keyboard, concentrating on getting into its feel. I tried to make it become second nature, but it didn't happen to me. There are lots of other Keytronic keyboard designs out there, some of which I love; any of them (other than the standard IBM layout) would be better than this.

The disk drives are TEAC half-height double-sided units. They work well and are unobtrusive, other than sounding a distinct "click" when the head-load solenoid pulls in. They are marvels of precision, jewel-like in construction. Naturally, copy-protected software that depends on the drive characteristics of the original PC won't work in this system. The Eagle's low-profile design precludes you from doubling up on floppy disk storage, since only the two half-height drives will fit. Canon's new half-height drive that holds two disks may be a solution, but chances are that the Eagle's two drives will be enough.

Troubles with Timing

There was another problem related to use of the keyboard, most likely the result of hardware and software interaction. The Eagle does not appear to buffer keystrokes especially well. This is most apparent when using WordStar. Typing a quick

sequence of control codes occasionally would leave the machine in a state where it only responded to some of the keys and almost never the one you wanted. A quick

COPY-PROTECTED software that depends on the drive characteristics of the original PC won't work in this system.

Control—OR52 to set the right margin to 52 characters would never be accepted. After pressing the Control key I had to wait until the "enter new right margin" prompt was displayed before I entered the value.

The Eagle has two scrolling modes: normal and slow scroll. The slow scroll mode is supposed to make the screen easier to read as lines come up on the screen. Many standalone terminals do this by shifting the entire screen up, raster line by raster line. The result is a stable image that moves up the screen smoothly. Eagle's method of scrolling is to redraw the screen from the top after having replaced the first line with the second. This is painfully slow and not especially easy to read; I wouldn't have recommended it. The scroll mode can be easily changed from Slow to Fast by the ASSIGN program, but the details are buried in an obscure part of the documentation having to do with printer set up. I had to call the factory to find out how to change it. The people I talked to there were courteous and helpful, so I have no complaint on that account. The documentation could have been a little more obvious in the first place, though.

The ASSIGN program also permits you to set up all of the Eagle's operating parameters, including port assignments, baud rates, and printer handshaking method. Since it is menu driven, ASSIGN is easy to use—it's a nice replacement for IBM's MODE command. If you save the newly assigned operating modes, they remain in effect until you change them again.

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CIRCLE 341 ON READER SERVICE CARD

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- **Expense recording:** Room for detailed entry of single or multiple expenditures connected with any appointment or reminder—including account, category and comments.
- **Recurring schedule items:** Put it in once, and it will reappear as many times as it needs to, no matter what the pattern of recurrence—whether it's the every-Tuesday meeting, a quarterly tax deadline or your mother-in-law's birthday.
- **Advance notice:** As much early warning of an item as you need.
- **Printed schedules:** Quick, hardcopy take-along schedules.
- **Expense reports:** Detailed expense summaries for any period of time you select, organized by account or category.
- **Check-offs:** Mark reminders completed, or let the undone ones stay with you until they're cleared up.
- **Histories:** Recall all your past appointments or reminders involving a given person or subject.
- **Multiple-user:** Share your SHOEBOX but retain privacy for your information with password protection.
- **One for all:** A single operator can coordinate schedules for many individuals.
- **Ease of Use:** No knowledge of programming languages required... Single-keystroke commands... Lots of on-screen help for the new user... Help always available—never more than a keystroke away... A User's Manual that's actually readable... Sensible defaults for data-entry options.

DEALER INQUIRIES INVITED

TECHNICAL SPECIFICATIONS

DATA ENTRY-

- User name: 1-22 characters
- User nickname: 1-8 characters
- User password: 1-8 character (if used)
- User working hours: any time of day to any later time of day, individually specified for as many as seven days of the week.
- Dates: Jan. 2, 1980 through Dec. 31, 1999 inclusive
- Schedule-Item Descriptions: 125 characters maximum, descriptions may include any printable character. In a string search 0-9 and/or letters A-Z are recognized
- Recurring items may be set up as either: one time only, daily, every so many days (user specifies number of days in a cycle), one or more times per week (user may specify up to six days of the week, by name, on which the item occurs), one or more times per year (each item may have up to six specified dates within any calendar year i.e. 2/27, 4/12...) or once in a while (user would specify up to six specific dates which can be used to tag such "moving" holidays as Easter, Passover, etc. i.e. 4/27/87)
- Expense account codes: 1-4 characters
- Expense account descriptions: 0-15 characters
- Expense categories: 1-4 characters
- Expense category descriptions: 0-15 characters
- Expense amounts: \$0.00 to 999,999.99 (defaults to dollar/decimal format but can be overridden)
- Expense comments: 0-15 characters
- Up to 127 user groups, each with an unlimited number of users. A coordinator system can be set up allowing one person to handle the affairs of members within a group.

SHOEBOX is a trademark of Techland Systems Inc.

SYSTEM CAPACITIES AND LIMITATIONS

Setup specification for individual users: 150 bytes
Appointment and reminder descriptions: 64 bytes each (short), or 128 bytes when required (long)
Expense entries: 64 bytes each
(The above figures are estimates as each individual use will set up and use SHOEBOX in ways which will vary the effect upon the disk's capacities.)

HARDWARE REQUIREMENTS

IBM, PC & XT and compatible machines using either DOS 1.1 or 2.0, with a minimum of 128K of memory. An 80 column monitor and at least one diskette drive is necessary to run SHOEBOX. Hard disks and RAM disks are also supported. A printer of at least 80 columns is desirable but not required.

Source programming language, C
Source code is not available.

Please accept my order for SHOEBOX and ship it at once. I understand that if I don't find it useful I may return it for a full refund.
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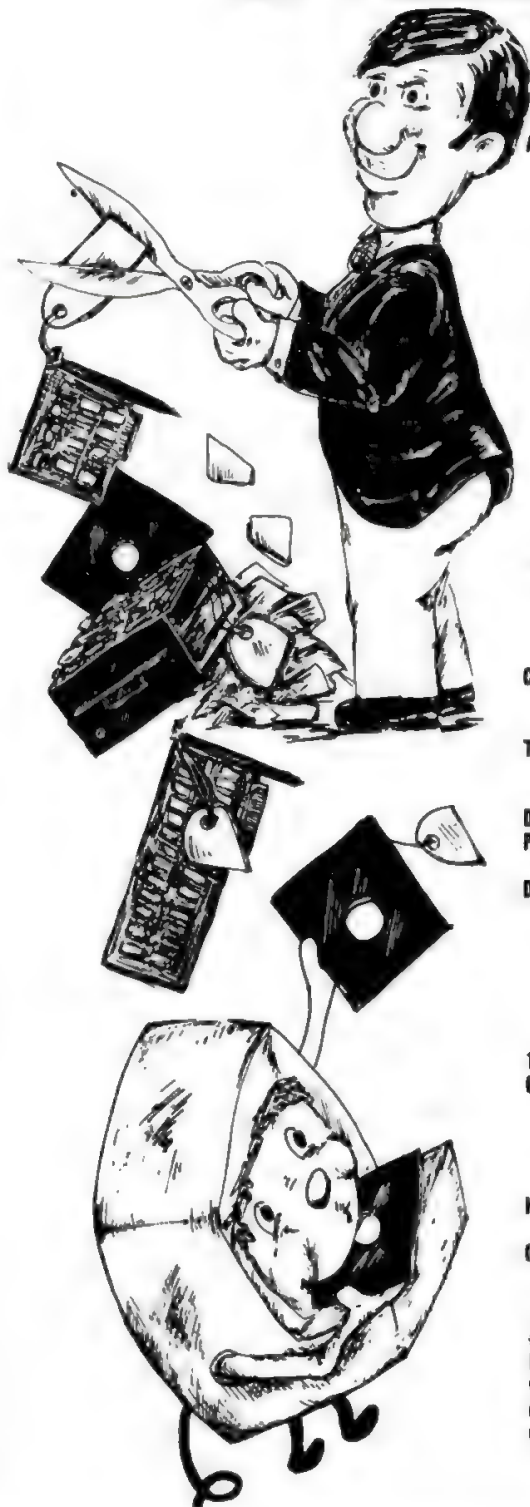
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CIRCLE 463 ON READER SERVICE CARD

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 Optional 2nd Serial **45.00**
 Optional MEGAPAK (256K) **275.00**

MICRO MATCH MM64-1 64K Expandable Memory with RAM test program **\$145.00**
MM39-1 Extender Board **35.00**
MM77-1 Prototyping Bd. **45.00**
QUADRAM QUADBOARD 64K Memory, Clock/Calendar, Parallel, 1 Serial & Quadram Software. **\$345.00**
SEATTLE RAM+ 64K Memory, 1 Serial & Flashdisk Software. **\$209.00**
RAM+3 64K Memory, 1 Serial, Parallel Port, Clock/Calendar & Flashdisk Software **\$289.00**
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DISK DRIVE PACKAGE Includes Disk Drive Adapter, 2 DS/DD Disk Drives, internal cable & instructions * **\$685.00**
DYSAN DISKETTES Box of 10 Double sided, DD **\$43.00**
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Software

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CIRCLE 320 ON READER SERVICE CARD

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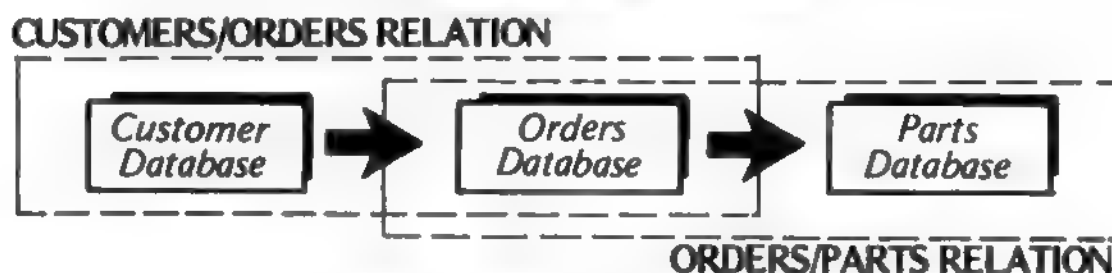
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dBASE II and CP/M are trademarks of Ashton-Tate and Digital Research

Dealer and Distributor inquiries invited.



Eagle's Software

Eaglecalc and Eaglewriter are two major programs that accompany the Eagle PC. A significant portion of the documentation is dedicated to these programs. As mentioned earlier, the machine comes with CP/M-86 in addition to MS-DOS. Curiously, Microsoft BASIC is not provided. I ran standard MS-DOS BASIC on the machine, however, and it performed as expected.

ASSIGN's menu-driven friendliness is typical of Eagle's approach to software. Eaglewriter and Eaglecalc are supplied on separate disks so that each can have its own automatically executed program that offers you the option of running the application, using some utilities, or quitting. The only thing I didn't like was the QUIT option. After displaying a message advising you to remove your disks and shut off the machine, it halts the processor so that you can't do anything else in that particular session without resetting the system from the keyboard by pressing Control-Alt-Delete. I'll grant that this may protect you from inadvertently damaging your disk files, but this degree of protection was something I could do without. I found it easier to eliminate the autoexec program and just type "EW" whenever I wanted to use Eaglewriter.

Eaglecalc is an unexceptional spreadsheet program. It is a VisiCalc and Multiplan "workalike," meaning that the functions it performs and the command mnemonics it uses are nearly identical to the ones in these well-known products. It supports windowing and consolidation and will probably be sufficient for home and light business applications. There are no surprises in using Eaglecalc; it performs as documented.

THERE IS
no such thing as
directions that are too
thorough and explicit.

Eaglewriter is a word processor with some very advanced features. Most notable is the Macro feature which allows Eaglewriter to do mail merges, sorts, spe-

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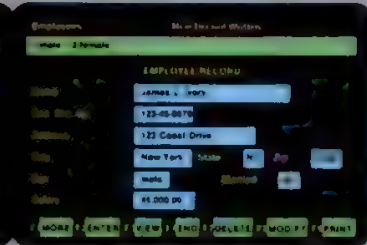
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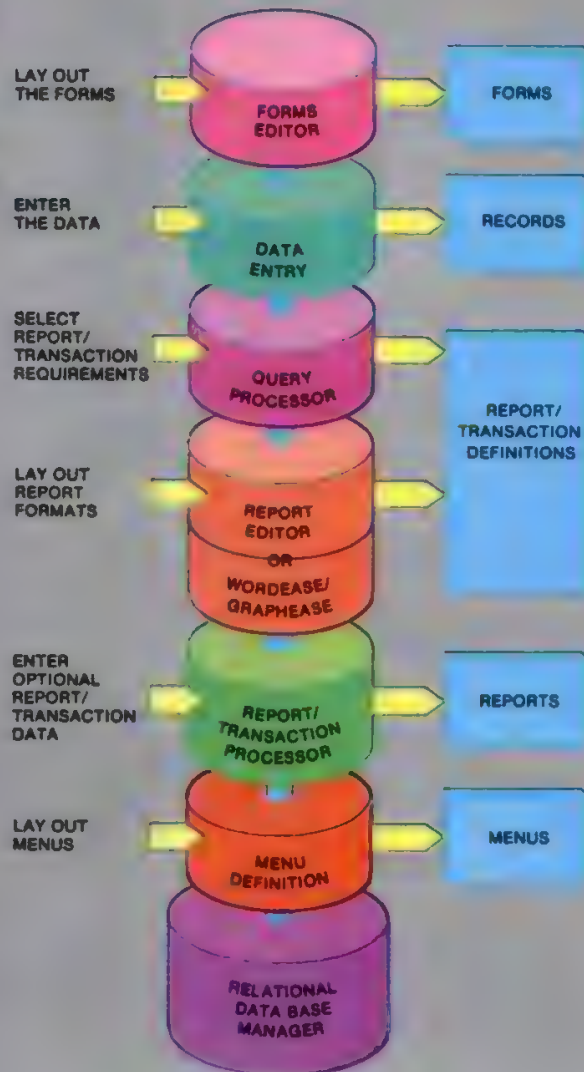
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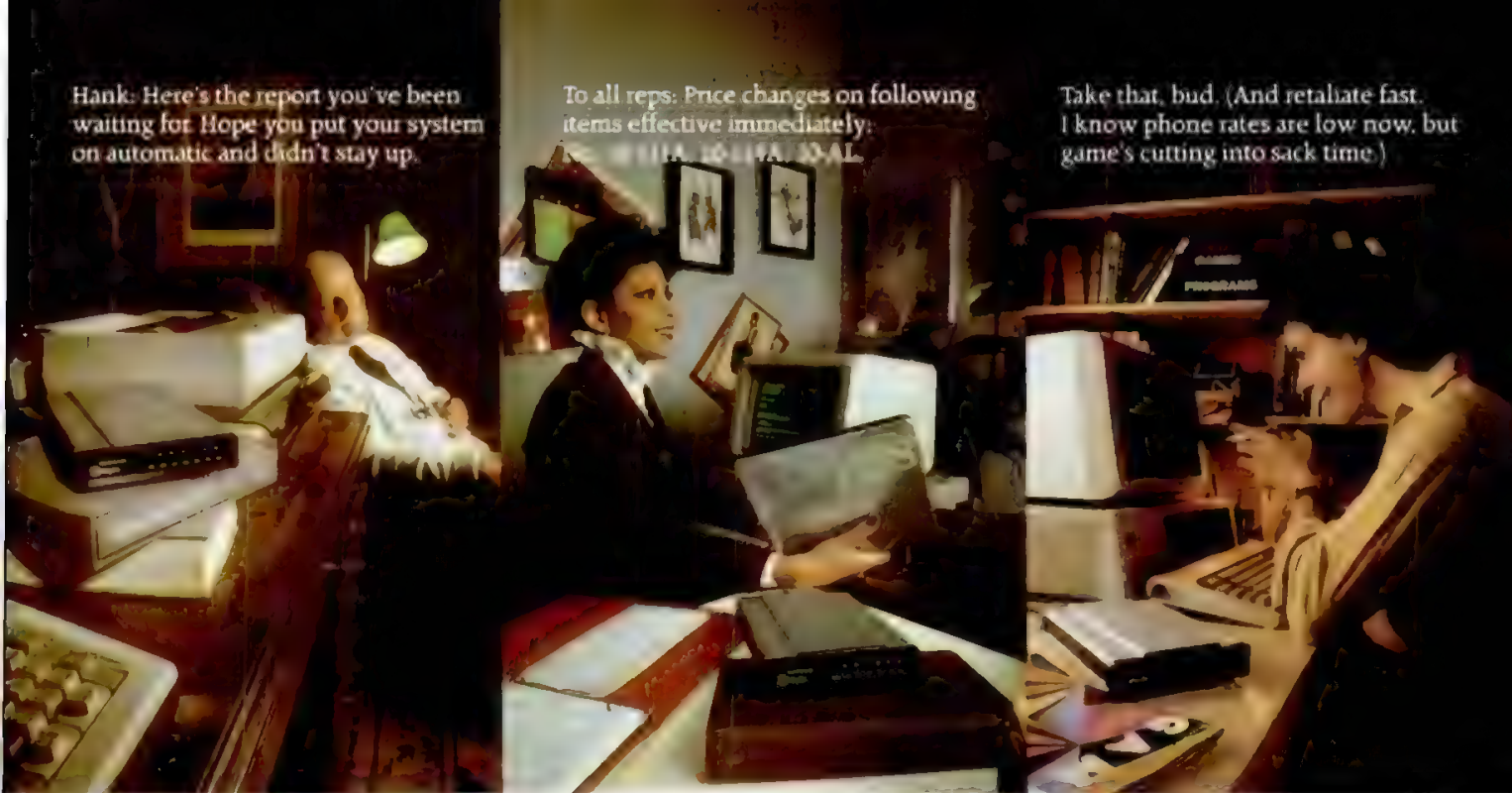
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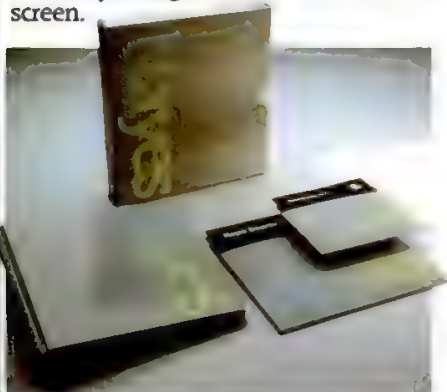
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cial forms, and other complex tasks. Using Eaglewriter will be simple for first time users, since the manual is very clear and you use the labelled function keys for most operations. The more advanced features of Eaglewriter will take some time to learn, since they are complex and quite open-ended.

You may have heard of Spellbinder, a consistently high-ranking word processor. Well, Eaglewriter is Spellbinder. Eagle bought the rights to the program and offers it on all of its machines. (See "Spellbinder Comes To The PC" in PC, Volume 1 Number 11.)

Eaglewriter uses the "cut and paste" technique for moving blocks of text. That is, you select the beginning of the text you want to manipulate with function key F14, then move the cursor to the end of the area. When you press the function key labelled "Cut" (F12) the text disappears from the document. If removing it was what you had in mind, you're all done. If you want to move that block elsewhere, you just move the cursor to the target location and press "Paste" (F13). If you cut something else out before you paste, you will lose the previously cut text. Most commercial dedicated word processors use the cut and paste method; it is easier to learn than, say, WordStar's technique. It offers the further advantage of being able to undelete a block of text when you make an error.

The documentation for the machine itself is reasonably good. It is oriented to guiding the beginner or first-time user through the basics of turning the machine on, inserting disks, starting programs, and the like. Missing is any mention of how to install an accessory board (a common shortcoming in manuals) or even how to open the case in order to stuff some more RAM into the system board. Mechanical procedures such as these may seem elementary or self-evident, but there's always more to it than meets the eye. Disassembling the Eagle requires removing a small squadron of screws. If you remove the wrong ones, a disk drive can wind up falling unceremoniously onto the system board. Given the tremendous range of experience and ability of the Eagle's potential users, there is no such thing as directions that are too thorough and explicit. All manufacturers of PC-compatibles would do well to emulate IBM's manuals, as well.

To lessen the number of times you experience the pain of finding out that a PC program you just bought won't run on your Eagle, the manufacturer includes a software guide that lists programs that have been tested and found to be compatible with the Eagle PC. The list exceeds 200 programs at present and continues to grow.

WORDSTAR, dBase II and BASICA worked without a hitch.

I ran all the usual day-in, day-out programs used in our offices at PC, including WordStar, dBase II, and BASICA. All worked without a hitch. I also tried Ashton-Tate's new Bottom Line Strategist, which worked fine, as well. This latter program is a good test of ROM compatibility; to adjust itself to the hardware environment of the machine that runs the program, it depends on information given by the ROM. I then mounted a color/graphics board, and played some favorite games and ran other programs.

There is a trick to getting the original version of 1-2-3 to work. You first must get hold of a copy of PC-DOS 1.1 and load that instead of the MS-DOS 2.0 supplied by Eagle. 1-2-3 will then load and run. This problem is eliminated by the new 1-2-3 version 1A. However, the default scrolling speed under anything but Eagle's implementation of MS-DOS is slow, a definite shortcoming.

To sum it up: the Eagle PC is a well-engineered machine with a strong emphasis on IBM compatibility. Its design is appealing and factory support is good. Expansion is somewhat limited, but no worse than, say, the Compaq's or even an original PC with IBM's equivalent I/O and memory boards filling the slots. Eagle should include Microsoft BASIC in the package and should replace the keyboard with one that has better layout and more tactile feedback. Other than that, the Eagle PC is a workmanlike product. The manufacturer can put another feather in its cap for its new line of computers. /PC

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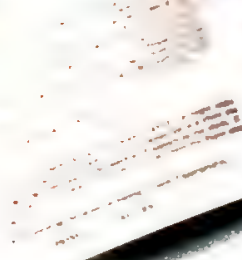
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IBM PC: BMOC* At Carnegie-Mellon

There's nothing unique anymore about a school that plans to set up personal computers on campus. Last autumn, Stevens Institute of Technology in Hoboken, New Jersey, began requiring that freshmen entering the science or systems planning and management programs had to buy Atari 800 microcomputers equipped with 16K RAM. Clarkson College of Technology in Potsdam, New York has signed an agreement with Zenith Data Systems to buy more than 1,000 Z-100 desktop computers with 128K RAM main memories. This fall, each Clarkson freshman will begin to include a computer as a standard part of the cost of his education.

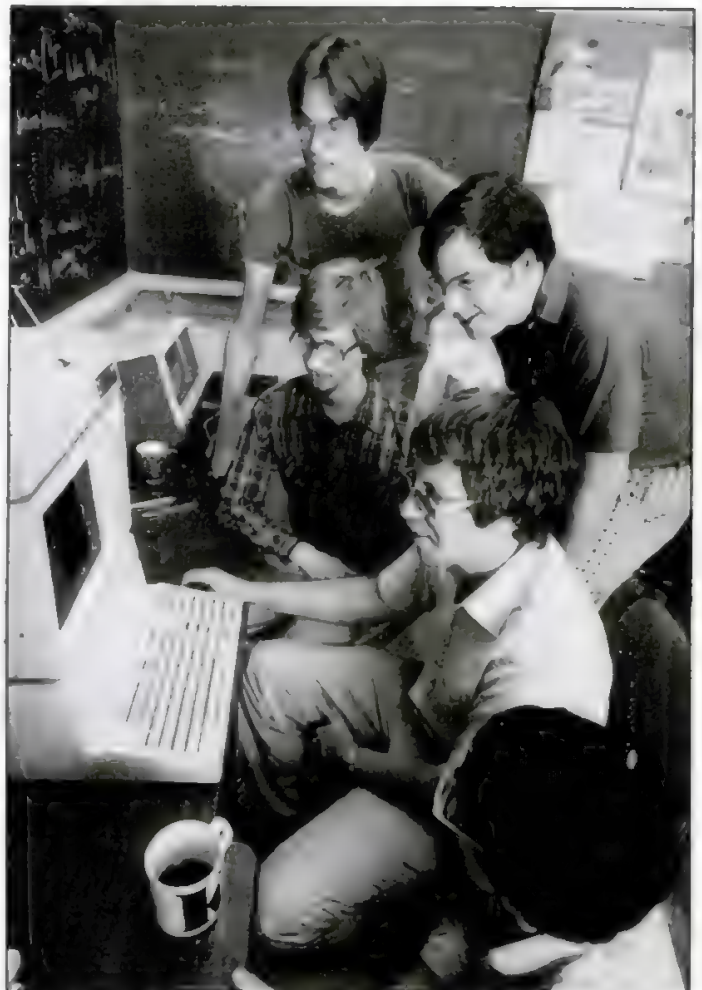
Then there's Drexel University in Philadelphia, the first in the country to require all entering freshmen (as of January 1984), even those in liberal arts, to buy personal computers. Drexel has contracted with Apple to supply them with 3,000 computers especially designed for them. Drexel will act as a distributor to pass along volume discounts to students, bringing the cost to each student down to \$1,000.

Great Expectations

The list of schools entering the personal computer age is growing every day, but the most grandiose plan of all is evolving at Carnegie-Mellon University (CMU) in Pittsburgh. CMU and IBM signed a 3-year agreement last October under which IBM will help the school develop a prototype computer network that will give CMU's 5,500 students direct access to the university's information bank. *Quid pro quo*, CMU will help develop a new personal computer operating system—if all goes according to plan.

The agreement expresses the intent of IBM to continue its support another 2 years, through 1987, depending on the progress of the project. Likewise, CMU has no hard commitment beyond the 3-year agreement. "It depends on what IBM does in its product plans," says Douglas Van Houweling, vice provost for computing and planning at CMU.

Van Houweling says that the decision to go with IBM in the



Electrical engineers at Carnegie-Mellon University use personal work stations for computer-aided design of microelectronic circuits.

*Big Machine On Campus

first place was based on the popularity of its hardware and the considerable amount of software available. He also says the "compatibility path" for existing PCs to

use software developed during the project is good.

The first order of business is for the new Information Technology Center on

campus, staffed jointly by IBM and CMU personnel, to develop the prototype integrated computer environment. This includes designing, developing, and testing a work station operating system and communications support, according to Jim Morris, director of the center.

The transition phase tentatively calls for the use of IBM PCs with 16-bit Motorola 68000 processors and perhaps bit-mapped graphic displays. It is expected that more than a hundred of these will be available on campus this year. The system will expand to several hundred in following years. Software is being developed to function in an environment based on Microsoft's XENIX, the look-alike for UNIX developed by Bell Laboratories.

The advanced phase includes introduction of the integrated computing environment by 1986, the year CMU may begin requiring that every student in every major have a computer. "By 1987, there will be more personal computers on campus than there are telephones today," Morris predicts.

By 1991, CMU plans to have about 7,500 personal work stations, each with its own powerful computer and graphics display, all interconnected through a high-speed local area network. In addition to communication lines between work stations, plans call for a unified data-file system and a central computing facility to be available to all work stations.

When completed, this network, allowing information to move in all directions, may be the largest in the history of personal computing, according to CMU authorities. The designers expect the network to encompass faculty, staff, and students in the greater Pittsburgh area through cable television or telephone lines.

The Student View

And what will students be paying for their system? About \$3,000 over 4 years.

This may seem like a lot of money for a segment of the population that is traditionally short of funds, but what a package they'll be getting! The work stations are expected to have a 32-bit processor with virtual memory capable of executing up to one million instructions a second, a million bytes of RAM, a high-resolution graphics display, a graphics tablet, and a pointing device such as a mouse.

Instead of using built-in disk storage, clusters of work stations will share a file



Students and faculty at Carnegie-Mellon University use the university's extensive network of time-sharing mainframe computers to aid in the educational process.

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server through a network. The clusters will be linked to each other, as well as to the mainframe computer. Disk drives will be optional for stand-alone operation. What kind? "Winchesters, of course," says Van Houweling.

Not all students are happy about what's happening on their campus. About

B_{Y 1987,}
*there will be more
 personal computers on
 campus than there are
 telephones today.*

two dozen of them protested last October when the CMU-IBM agreement was announced at a news conference. They argue that costs at CMU are already too high. Tuition is jumping 19 percent this year to an annual undergraduate cost of \$7,500.

Others are questioning why every student should be required to join the network. They say drama and fine arts majors don't need computers as much as students in other disciplines do.

But the for and against split is not down the science/humanities line. What controversy there is centers around what input students will have in the planning process. Students do not want to be left out of the decision making, according to Student President Nathan Solano, a public policy and management major.

Students will be able to take exams, write reports, and send messages electronically. Research analyses, library documents, and self-study courses will be available at the work stations. Distant data banks as vast as the U.S. Census Bureau will be only a command away. And that's only the beginning.

A Unique Plan

Three elements make the CMU plan unique. First, every student in every discipline may be required to have a personal computer. Second, these won't be off-the-shelf machines. Instead, they are to be custom-designed, according to the CMU-IBM agreement. Third, these machines will be joined in a communications network that



Researchers at Carnegie-Mellon University use computers of various sizes to analyze experimental data and control equipment.

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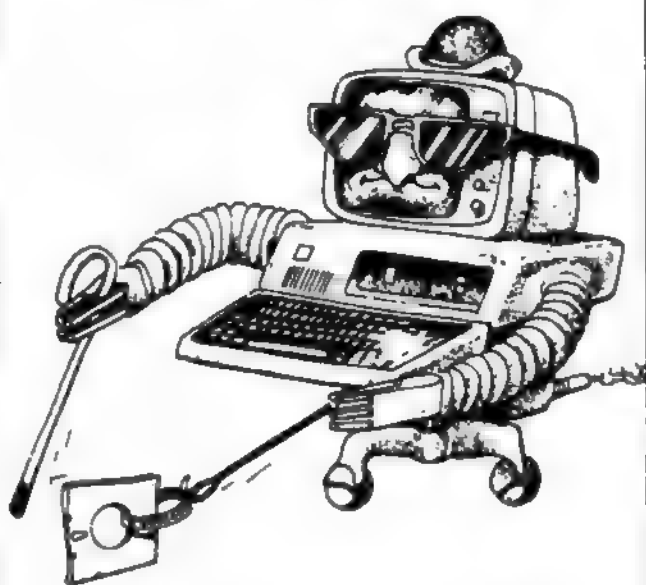
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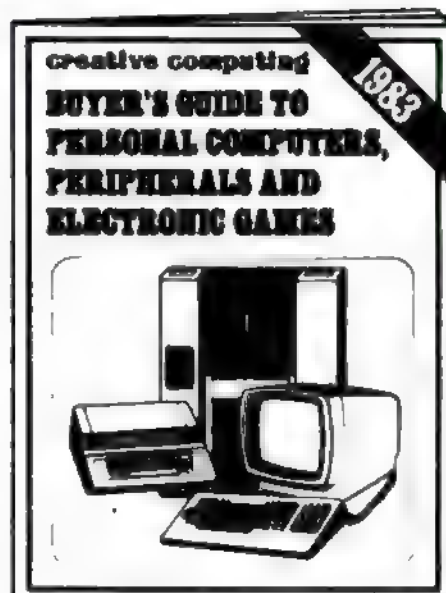
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will enable users to interact with one another and with data banks. There are plans to extend the network to other campuses around the country via satellite.

Nice, but why is CMU having its Personal Computers designed from scratch? Because it already has a sophisticated time-sharing mainframe called TOPS. Students currently have far more power at their fingertips than any off-the-shelf ma-

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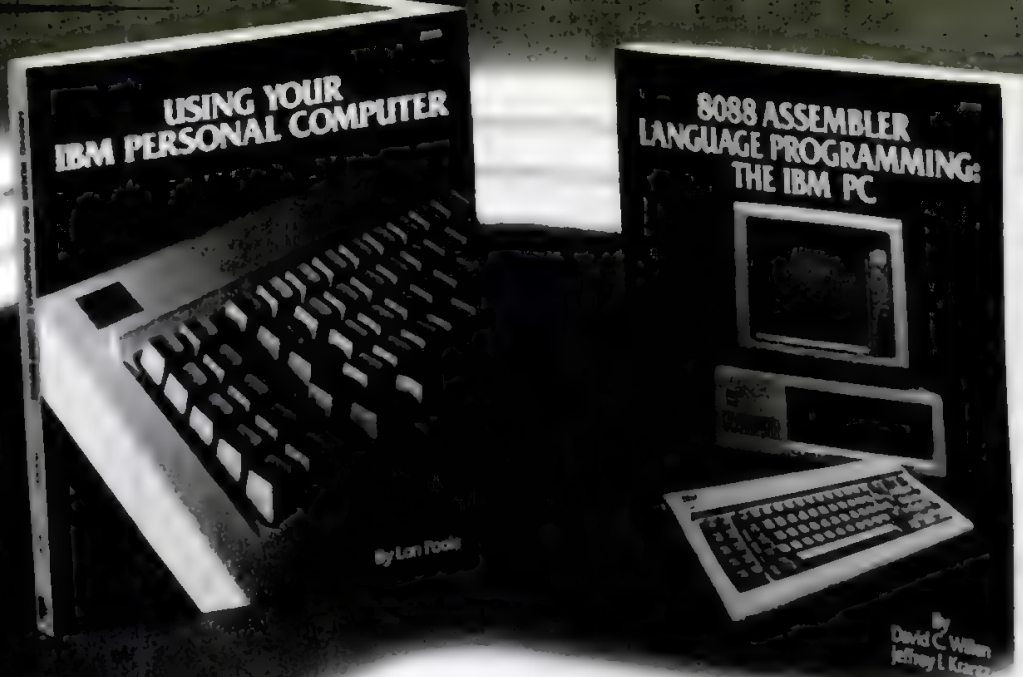
An aerial view of Carnegie-Mellon University.

chine offers. The new computers will have to be designed to do at least as much as TOPS, and preferably more.

And what's IBM getting out of the deal? Knowledge about college-level computer needs and applications. Knowledge equals profits should IBM want to market its expertise somewhere else. Further, IBM's involvement in development of the prototype network and participation in testing of theories and development of new products will result in a showpiece of IBM technology, according to CPD News, an IBM publication. Besides, IBM keeps any patents that result from the project.

Carnegie-Mellon University is justifiably proud of being at the forefront of innovative computer applications. President Richard Cyert has been quoted as saying, "This will be looked upon some day as one of the most significant steps in higher education in the twentieth century." He claims that the network "will have the same role in student learning that the development of the assembly line had in the production of automobiles." /PC

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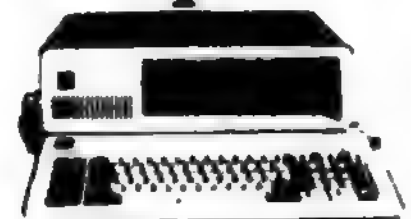
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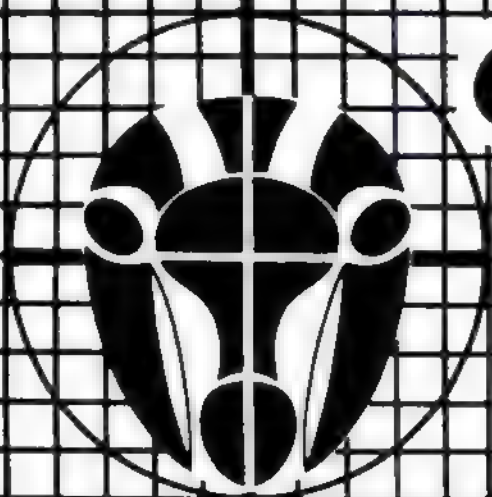
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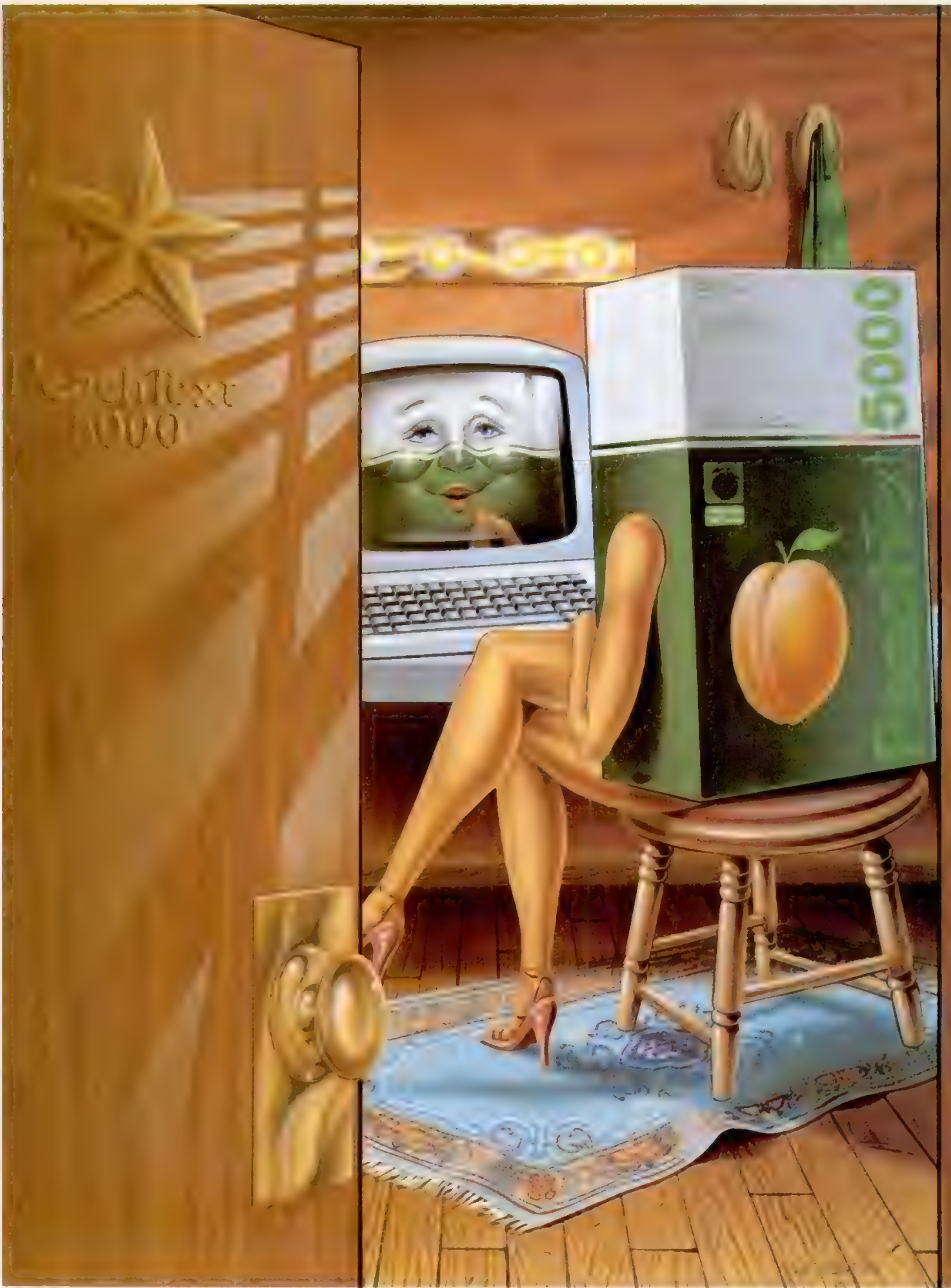
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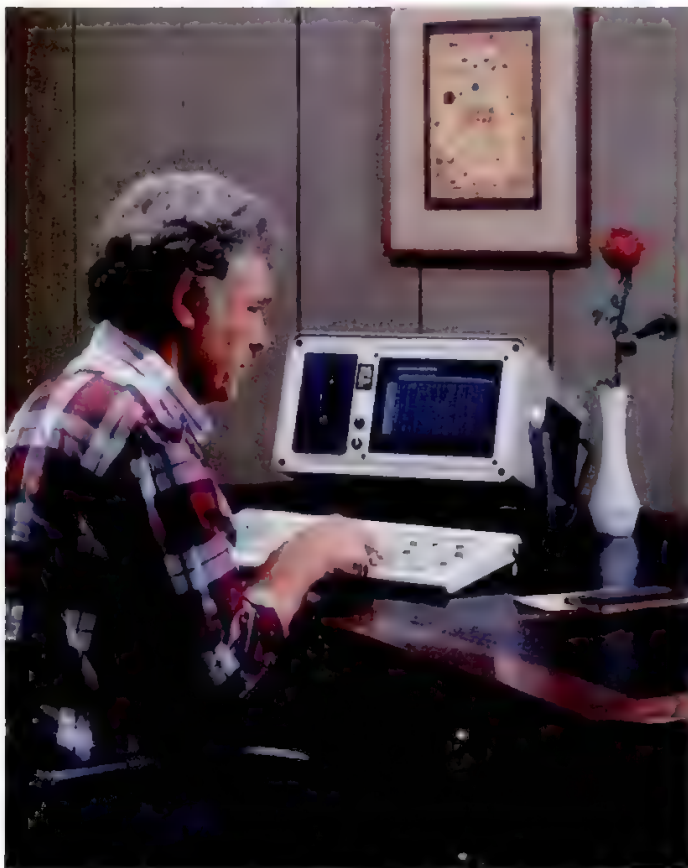
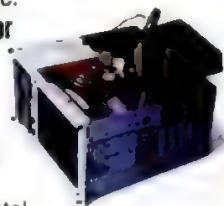


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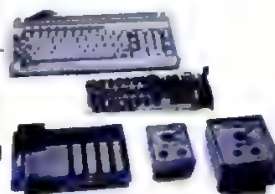


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An enterprising audio engineer teams up with the IBM PC to simplify the complicated process for mixing and mastering sound.

The PC Sounds Off

Although most computer stories are supposed to begin in Silicon Valley, or perhaps along Route 128 on the periphery of Boston, such is not always the case. For instance, it's been said that one story actually began in Rat's Mouth, Florida. No doubt, this exotic name, which is translated from the Spanish Boca Raton, was a factor. This story, however, begins on Route 25A.

Route 25A, or Northern Boulevard as Long Island locals call it, was the home of "Audio by Zimet," a minor legend in the annals of hi-fi folklore. It was here that Long Islanders in search of audio purity would gather to buy whatever products Sid Zimet thought were worth selling, usually at list price. Zimet insisted on backing up his sales with service, whether the customer wanted it or not. Those who didn't were invited to congregate elsewhere.

Downstairs Upstairs

Zimet's product line eventually expanded to include recording hardware for the basement studio operator. And since there wasn't enough of that available, he

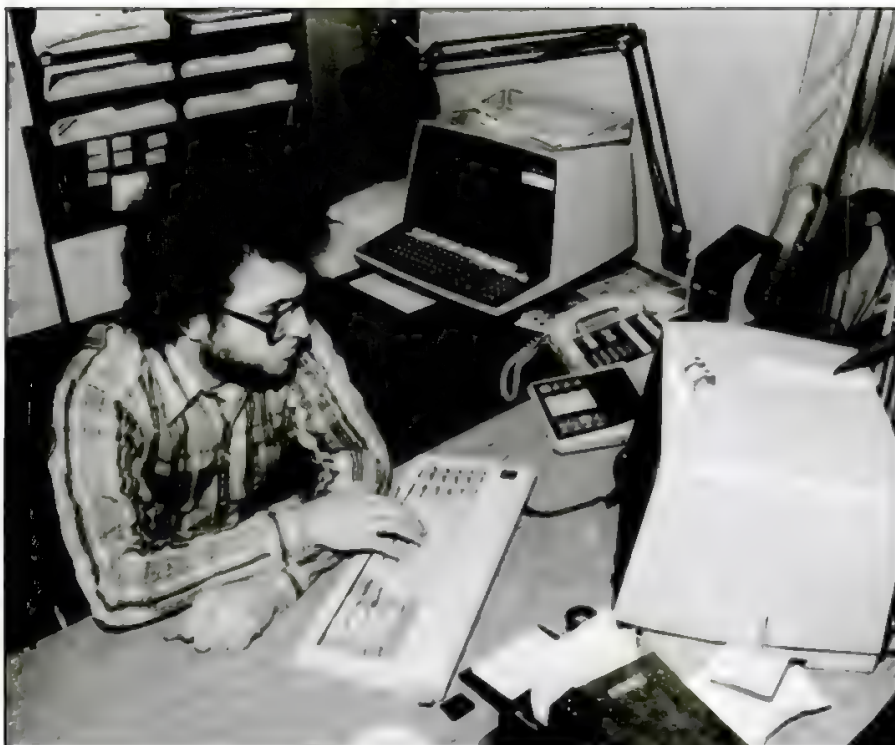
ALTHOUGH
*the hardware was up to
the task, the engineer
often was not.*

and his partner, Michael Tapes, began manufacturing a line of products under the label "Sound Workshop." It all started in the Zimet basement and wound up in

the showroom upstairs. And later, in the showrooms of other studio suppliers across the country.

Michael Tapes got into the audio business after a year of computer science at City College made him swear never again to go near anything so impersonal as a computer. In 1969, he dropped out of school to pursue an interest in music and electronics. While working as a service manager for a local Lafayette Radio outlet, he got involved with his own band. This led him to Hempstead's Ultrasonic Studios, first as a part-time client and later as a full-time employee. From there, a growing interest in the hardware side of recording led him out of the studio and into partnership with Zimet.

In time, their Sound Workshop line expanded sufficiently for the company to establish a separate identity, and to move into its own facilities in Hauppauge, New



Sound Workshop's Michael Tapes at work.

York. In existence for about 8 years, Sound Workshop Professional Audio Products, Inc. is now a manufacturer of recording consoles, and despite Tapes' early vow, computer-based automation systems for the recording studio.

While Sound Workshop was establishing a name for itself in the professional recording industry, that industry was moving closer and closer to computers. In a recording studio postproduction session, it was not unusual for an engineer to maintain control of some two dozen or more separate audio signals, combining them into a well-balanced stereo program. Although the hardware was up to the task, the engineer (with only ten fingers) often was not. Clearly, the time for automation—that is, for computers—had come, whether Michael Tapes liked the idea or not.

Early Audio Automation

The need was there, and the company developed a widely-used studio automation system. Since its price tag placed it above the reach of the early Sound Workshop customers, the rights were sold to MCI (the console manufacturer, not the phone company), which marketed the product as the JH-50 Automation System. It was based on the 6502, which in pre-Apple days, was considered pretty progressive.

Conceptually, the JH-50 stored the

movements of the console faders as the engineer balanced musical inputs. Later, the computer would reproduce this information, and the engineer, freed of the necessity of trying to balance all inputs simultaneously, could revise various sub groups within the total program.

These first automation systems stored their data on one of the tracks on the same multi-track tape machine used for recording the music. As the engineer mixed and remixed all the music tracks, this mixdown information was encoded into a digital data stream and the expression, "Don't worry, we'll fix it in the mix," was born.

Of course, anything that can be fixed, can be refixed, and then, fixed again. And it takes nerves of steel to erase a data track, while writing a new mixdown program. So, the new mixdown program would be recorded on another track, thus preserving the old one, "just in case." In no time at all, the engineer would find himself running out of tracks, as various "improved" mixdown programs were saved, as a hedge against having second thoughts in the morning. (Naturally, this sort of thing would just never happen to a computer programmer!)

Soon enough, more sophisticated (read: more expensive) systems were introduced, and these were floppy-disk based. Beyond the advantage of allowing the storage of many variations on a theme, it also became possible to merge the best

aspects of several mixes, via computer keyboard instructions. All you needed was about \$70,000 to get your feet wet, as long as you already had a console.

For customers who already had an otherwise-satisfactory automation system, the step-up to disk could be especially painful. It meant scrapping the entire system and starting all over again. In these days of higher and higher technology, isn't it a comfort to know that we are all united in incompatibility?

Disk-based Storage

Sound Workshop's next step was the only obvious one: to come up with a disk-based storage system that would be suitable as a simple add-on to the automation systems they had already built. This would allow the benefits of disk-based automation, while freeing the recording tape for storing just the music.

The system was aptly dubbed "Diskmix," and it now consists of a proprietary dual-processor CPU, two 8-inch floppy-disk drives, an intelligent disk controller, and the necessary power supplies.

***THE JH-50
Automation System
was based on the 6502,
which in pre-Apple
days, was considered
pretty progressive.***

Basically, the Diskmix memory loads up to 2½ minutes of mixdown data from disk, and then notes any changes between this memory and the current status of the console controls. These changes are rewritten to disk, along with data that notes the time at which each change occurs. SMPTE time code, the same as is used to sync audio and video in film and TV production, is used for this purpose as well as to keep the memory buffer in sync with the audio tape.

A separate control computer serves as the interface between the engineer and the main computer. At first, Diskmix used a VIC-20 (remember, this was

several years ago). The VIC's 4K memory soon became a major limitation, as did the many cables connecting the keyboard to the system. Next in line was the

THE BIG advantage of INKEY\$ is its ability to ignore almost all unacceptable inputs.

NEC PC-8001A, which had a better keyboard and 32K memory. The Apple was never considered, since Diskmix needed a small, easily moved keyboard that could be conveniently placed near the operator, yet would not obstruct the actual console operation.

While working on the Diskmix manual, Michael Tapes purchased an IBM PC and WordStar and became an almost-overnight convert. The keyboard was an asset. There was only one cable. The PC had good serial communication capability. IBM was a prestige name.

The basic control computer soon became a PC with 64K, an RS-232 port,

and a color-graphics card whose composite video output drives a black-and-white Amdek monitor. (Actual color graphics may be added later on.) A custom ROM is installed in the extra ROM slot. To boot the system, a couple of simple commands access the ROM, and a screen display instructs "Load Diskmix into the IBM" (via the RS-232 port).

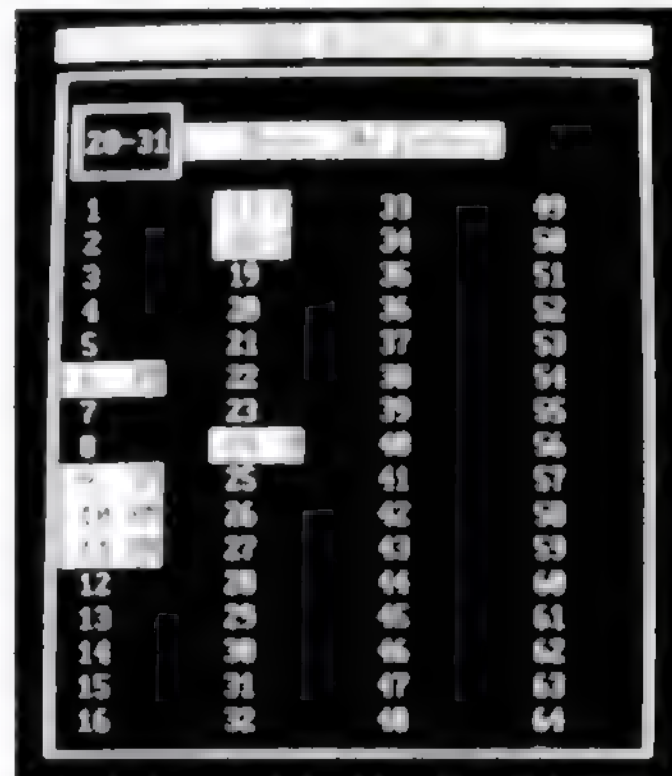
Although Michael Tapes shows every sign of turning into a certified hacker, he has not changed his aversion to the impersonal aspects of computing. He likes his programs to be user-friendly, and toward this end regards INPUT with the same suspicion that others reserve for GOTO.

An Answer to Unfriendly INPUTS

To shun unfriendly INPUTs, every Diskmix routine is handled with an INKEY\$ statement. In fact, the system is almost always in an INKEY\$ loop. Even in conventional programming, tapes like to treat numeric variables as strings, using an INKEY\$ loop. The finished string can be converted to a numeric value using the VAL statement.

The big advantage of INKEY\$ is its ability to ignore almost all unacceptable inputs. For example, consider an INPUT ... oops, an INKEY\$ command, in which the only acceptable entries are the Escape

key, the Tab key, and the numerals 2, 4, and 7. To begin, simply define a string variable containing these five keys. Using the ASCII value for Esc and Tab (27 and 9), this becomes $Z\$ = \text{CHR}\$(27) + \text{CHR}\$(9) + "247"$. Enclose any other acceptable entries within the quotes, or use their ASCII values, as appropriate. Now, after a $K\$ = \text{INKEY}\$$ statement, the instruction $K = \text{INSTR}(Z\$, K\$)$ will return the position at which $K\$$ appears within the $Z\$$ string. Finally, an $\text{ON } K \text{ GOTO}$ (or GOSUB)



In the Edit Active mix mode, the screen displays the status of various console faders on the recording console. As indicated in the upper left-hand box, faders 28-31 are about to be assigned. Faders 6, 9-11, 17-18 and 24 have been previously assigned.



In the typical postproduction studio, the recording engineer has more than enough knobs and switches to play with. The PC keyboard is a reasonably friendly intruder, and can be quickly moved about as required.

instruction will send the program wherever you like, depending on which key was depressed. Note that the statement $\text{INSTR}(Z\$, K\$)$ will return a 1 whenever INKEY\$ finds the null string (that is, no key is depressed). Therefore, if the INKEY\$ statement is, say, line 30, add $\text{:IF } K\$ = "" \text{ THEN } 30$, the line will keep repeating until a key is pressed. This will keep an erroneous 1 from reaching the $\text{ON } K \text{ GOTO}$ line. Once any key is depressed, if it is not Esc, Tab, 2, 4 or 7, then $K = 0$, the key is ignored, and the program goes back to the INKEY\$ statement. A routine that can accomplish all this is given in Figure 1.

All this takes more programming than a simple Input statement, but it cuts down greatly on operator error later on. And when the computer is being used as a production tool for a session that may be costing the client about \$200 an hour, it's not a good idea to have errors, especially if you



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CIRCLE 126 ON READER SERVICE CARD

hope the client will come back.

To help keep errors few and far between, the Diskmix program is fully menu-driven, and most on-session work is simply a matter of responding to various Yes/No options. Using INKEY\$, the Diskmix program has been written to allow the engineer to toggle back and forth quickly between Yes and No, using the space bar or Delete key. The large plus (+) key has been programmed to perform the Enter function, making Diskmix a mostly two-finger exercise. With one finger on Del and another on +, the engineer can devote minimal attention to coping with the hardware and pay more attention to the music.

From time to time—usually at the beginning of a mixdown session—a series of instructions may need to be entered using one or more of the PC function keys. Whenever this is required, the screen displays the function keys and their normal default values, as shown in Figure 2. When any function key is toggled to a non-standard condition, that key is displayed in the flashing mode to alert the operator to the change.



Figure 2: On the left side of the Mix Menu, the assignment of the PC function keys is displayed. (F2-F4 are not yet assigned.) Any key in a nonstandard configuration will be displayed in a flashing mode. On the right side, the reverse-print display indicates that the Merge Tracks mode has been selected. Other choices may be made either by entering the appropriate number or by simply toggling through the choice menu.

```

10 CLS
20 Z$ = CHR$(27) + CHR$(9) + "247"
30 K$ = INKEY$: IF K$ = "" THEN 30
40 K = INSTR (Z$, K$)
50 ON K GOTO 100, 200, 300, 400, 500
60 BEEP: GOTO 30 'whenever K = 0
100 PRINT "You pressed ESC key.":END
200 PRINT "You pressed TAB key.":END
300 PRINT "You pressed 2.":END
400 PRINT "You pressed 4.":END
500 PRINT "You pressed 7.":END

10 CLS
20 Z$ = CHR$(27) + CHR$(9) + "247"
30 K$ = INKEY$: IF K$ = "" THEN 30
40 K = INSTR (Z$, K$): IF K = 0 THEN 30
50 ON K GOSUB 100, 200, 300, 400, 500
60 GOTO 30
100 PRINT "You pressed ESC Key.":RETURN
200 PRINT "You pressed TAB Key.":RETURN
300 PRINT "You pressed 2.":RETURN
400 PRINT "You pressed 4.":RETURN
500 PRINT "You pressed 7.":RETURN

```

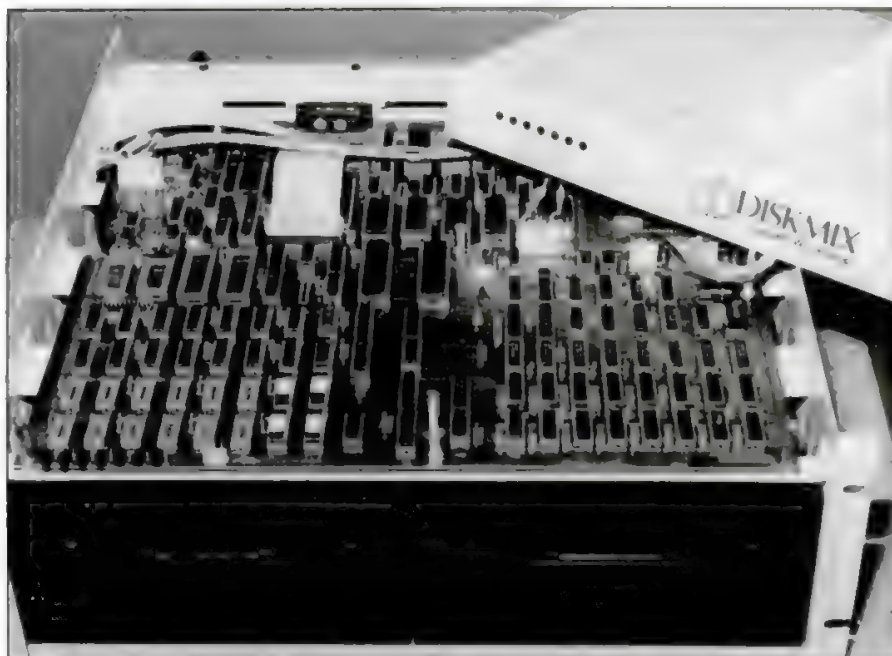
Figure 1: The short program segment illustrates the use of INKEY\$ in place of the customary INPUT statement. The first version provides a beep, warning that an unacceptable key has been depressed. In the alternate version, GOSUB has been used in place of GOTO. In either case, the last five lines (100-500) would be rewritten to provide the appropriate instructions.

Software Development

In developing the latest Diskmix software, Tapes is quick to credit other software authors for their assistance. For example, recent program enhancements have included the partial screen-clear program that appeared in PC Tutor (PC, Volume 1 Number 10). Diskmix now also uses a modified fast-print routine, based on the one described in IBM User Update UU-12 (February, 1983). Store-bought favorites include the Norton Utilities, ProKey, and Tall Tree's electronic disk utilities.

From the beginning of the PC connection, editing has been done with the PC BASIC editor and with DOS EDLIN, which Tapes feels is the fastest game in town for making quick search-and-replace edits. To make the BASIC editor even more powerful, Tapes has nothing but praise for Ken Snapp's Softool BASIC Development System. This allows search-and-replace in the BASIC editing mode, dynamic cross-referencing of line numbers, location of variables and keywords, and movement of program blocks with renumbering capability. It also has a mode that permits stepping through the program line-by-line.

With the IBM PC now an integral part of the complete Diskmix system, Sound Workshop is putting its own in-house PCs to other tasks as well. With an 8087 co-



The DISKMIX system's dual-processor CPU with two 8-inch floppy-disk drives.

processor, and interfaced with a Houston Instruments plotter and AutoCAD software from Autodesk, a PC is now used for computer-aided design work, including the production of schematic diagrams, panel layouts, and other artwork. SuperCalc is being used for business projections, and once Tapes finishes his own

emulation program, the company's Wang business system may be phased out to allow the use of PCs as individual work stations. Despite his persistent reservation, Michael Tapes and Sound Workshop Professional Audio Products have made sound progress by connecting with the PC. */PC*

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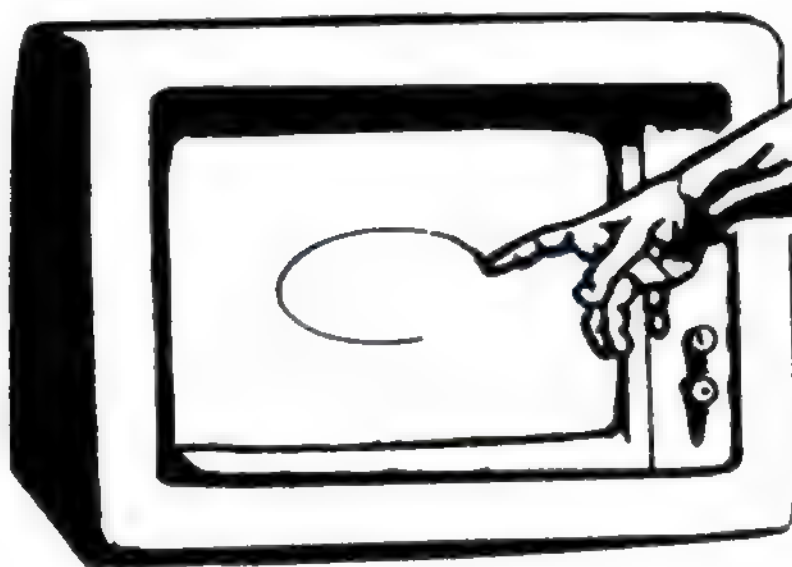
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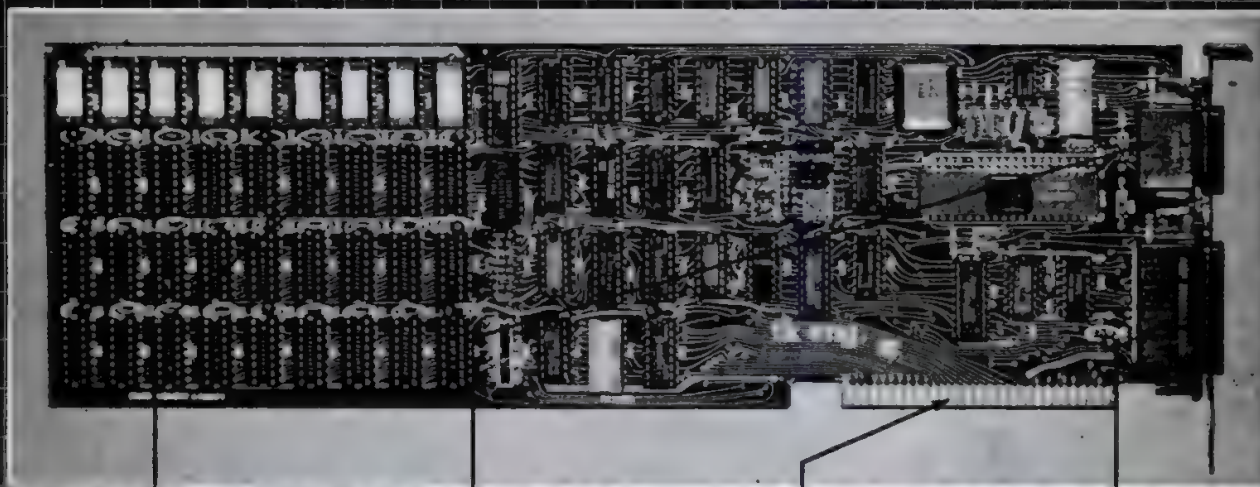
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Our first-time user may not know much about computers, but once he discovers word processing he certainly knows what he likes.

The Computer Virgin Gets The Word

Well . . . (as our President might begin) there I was at home with four impressive boxes emblazoned with the classic IBM logo. My efforts to buy an IBM PC hadn't been easy, but now that I had it, I took my sweet time unloading the car, hoping that one of my neighbors in the apartment building would wander into the hall and be suitably impressed with my new possession. On second thought, when I consider what the people in my building are like, it's just as well they don't know that close to \$5,000 worth of easily-moved equipment now lies behind my thin, wooden door.

I have been told that the editors of PC, after reading my story about how I shopped for a computer, started referring to me as "the computer virgin." I now can tell you that when I opened the boxes in my apartment, I no longer felt like a virgin . . . if you get my drift.

It wasn't that I couldn't figure out how

to hook up the stuff. Actually, that part was easy, since I've spent years fooling around with my television, video recorder, cable line, outside antenna, and stereo

***I**TS JUST
as well they don't know
that \$5,000 worth of
equipment now lies
behind my thin, wooden
door.*

amplifier. Believe me, after such experiences, hooking up the PC was a snap. Only, I think that the loose, round piece of metal on the printer plug was supposed to be grounded someplace. But, what's the

difference? I mean, the printer works fine with it just hanging around doing nothing.

Passing the Book

I guess by now it should be evident that I'm not the sort of person who writers of technical manuals gear their efforts toward. My attitude has always been that life should be a challenge—and reading how to set up complicated equipment would certainly make it less of a challenge.

Of course, I say this now knowing full well that it would be even more of a challenge for me to read the manuals. Not that they are poorly written or unintelligible. As a former teacher of high school creative writing, I'm used to that kind of material and have good luck at deciphering it.

No, the problem is rather personal. A couple of my best friends are employed by IBM to write technical manuals. It bothers

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me terribly to think that any friend of mine might have had a hand in writing these things stacked in front of me. I could ask, of course, but if it were true, I'd find it exceedingly difficult to respect them ever again.

I mean, have you looked at the Saran-wrapped concoction called BASIC? It

starts out with a rather thorough disclaimer: "In order to use this manual, you should have some knowledge of general programming concepts; we are not trying to teach you how to program in this manual."

Fair enough. I mean they truly succeed in not teaching how to program. But it

would have been nice if their little book suggested just where to get some of those general programming concepts. Don't they realize people like me will open the boxes with great expectations and absolutely no idea of what to do?

And IBM had better not have meant to start teaching me with the manual that came with PC-DOS. All I wish to say is that after about 2 hours of reading it I wondered why I hadn't used my \$5,000 to hire a professional typist for the next decade. Then I discovered EDLIN and was delighted to have a chance to write something of my own choosing on the screen.

Maybe I'm a bad student—all right, I know I am. And maybe I should have had the patience to follow instructions and continue doing things that neither made sense to me nor accomplished what the manual said they would in the first place.

But, good lord! I've read Joyce's *Ulysses* and Ezra Pound's *Cantos*. Even though I didn't understand them, I was at least able to enjoy them. Shouldn't I expect as much from something that had been billed as "user-friendly"?

Getting the Word

I want you to remember my initial feelings, for I am about to enter the part of this story that has a happy (or at least glad) ending. For, despite the frustration I felt during the first few hours my PC and I spent alone together, I ended up falling in like (if not in love) with it. If we spend much more time together, I may actually develop a serious relationship with my PC.

This change of heart came when I reached a point at which I felt I would forever be a fool at the keyboard. As a last, desperate measure, I opened the Easy-Writer II package, turned to page 1-3 of the manual, and offered a small prayer of thanks to the god of silicon when I read the first paragraph: "Because it is recognized that your system may be used by persons having little or no computer knowledge, the description of the system and its operation has been kept as nontechnical as possible."

Now I'm no babe in the woods. I had learned from my purchasing experience that people in the computer field tend to think terms invented just a few months ago aren't really technical. As a result, I wasn't completely confident that I was



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being told the truth. However, it was nice just to see that someone out there would at least say he cared.

The first steps in the instructions were easy; they seemed to make enough sense, so I was willing to follow them. All I had to do was put various disks into the two drives and push the keys the way I was

instructed. In the end, I must have done something I wasn't supposed to do, because I ended up using three more blank disks than the manual said I would have to. I still haven't figured out which ones were extra, but since I'm writing this article on the ones I made, I'm not about to stop and fix something that's working.

The true beauty of EasyWriter II's manual was in the "Self-Teaching Document." I fully realize it was written in basic, no-nonsense English, geared to the average

I ENDED
up falling in like (if not
in love).

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fifth grader. However, when I turned to it after my experiences with the PC-DOS and BASIC manuals, I was delighted. The difference was a little like conversing with a reporter from the National Enquirer rather than Alex and his droogs in A Clockwork Orange. Neither is necessarily the ideal, but at least you can follow what the first one is saying.

At any rate, I dutifully sat down and began the hour-and-a-half tutorial, patiently obeying every command, faithfully pushing every F7 and F10 key it told me to. Even though I took frequent breaks to check on the progress of a Seventy-Sixers playoff game, I still felt that I was making some real progress.

By the time I could insert and delete, underline and boldface, and even change margins, I was one cocky computer operator. Of course, I know this sounds like "pride cometh before a fall" stuff, but for some reason the fall never happened.

After making a firm mental note that page 29 had a list of everything I might have to look up, I boldly created a new file, named it "Poem," and typed in my latest poem. It worked.

Sad to say, the poem didn't read quite as well on a computer screen as it did in my imagination. This fact didn't do much for my ego, but I was so delighted to have the damned machine do what I wanted that I was even willing to concede to its glaring, unspoken criticism that the first thing I wrote with it wasn't very good. (This disappointing poem also gave me my first chance to learn how to delete a file.)

Come Watch Me Work

Next came some serious stuff. Real writing—the sort of thing I had to deliver to a printer by the next day for a publica-

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tion of the company that pays my weekly checks. Page after page came pouring out, interrupted only by my frequent forays to find someone to look at how well I was doing. Now, I'm a large man and have never been called "kittenish," but that day I did act a little like a cat that had just mastered the intricacies of a ball of yarn. I was

even pleased when my friends found errors in my text.

"Misspelled a word," you say? Watch this! And with a click of the cursor and a tap on the delete key, magic would happen right before their eyes.

Actually, not one of my friends was all that impressed. But since this was my first

experience with the PC, I figured I had a right to strut a little. "That's nice" was about the strongest comment I heard, but that friend was talking about the PC, not my writing. What they all failed to appre-

I NEVER
forget the great
statement "Work is the
curse of the drinking
class."

ciate was not the wonder of word processing, but the wonder of me doing word processing.

I did not think it was very funny when several friends told me that the printer sounded like I was grinding a set of duplicate keys. I suppose they're just jealous. Or ignorant—like me 2 weeks ago.

Not that I'm that smart now, mind you. I mean, I still haven't got the foggiest idea how to use BASIC or what most of the PC-DOS manual was talking about. My instincts tell me that this machine has a ghost in it that is capable of doing a lot more than printing my poems and articles. Someday soon I will take the time to find out how.

Frankly, I feel as if I've entered a brave new world (in Shakespeare's sense, not Huxley's); I know I've only begun to see the possibilities of this remarkable machine. The novelty of it all has captivated me, so I've spent far more time writing than I usually do at my old typewriter.

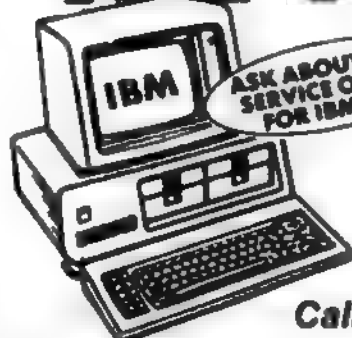
However, I can see the day coming soon when the PC will become a tool. I'll start to save lots of time that I now lose in the drudgery of retyping, editing, and proofreading. And then the PC will free me from writing to do the truly important things in my life.

For example, you may not have noticed my name, but it's Kennedy. And that's Irish. While writing may be my work, I never forget the great statement of Oscar Wilde: "Work is the curse of the drinking class."

Yes, I'm looking forward to a long and happy relationship with my new friend. Here's to it!

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Capturing your favorite computer graphics on film is trickier than you might expect but nothing the right "video camera" can't handle.

Screen Gems: From Monitor To Film

Have you ever wanted to peel a particularly informative or spectacularly beautiful color image off your IBM PC monitor screen to display it to the board of directors, send it to a publisher, or donate it to the local museum of art? Without even trying, you probably figured that you were bound to be frustrated, that your graphic creations were doomed to be forever sealed behind the front glass panel of your monitor's picture tube.

The desire to save your images is understandable. Certainly the color graphics on your IBM PC monitor screen are a vivid, concise, and clear way of putting your ideas across, but in themselves on-screen graphics are explanation rather than communication. Gathering the management committee around your PC for a graphic display detracts from the impact of the message. Sending your vid-

eo image across the continent is troublesome; your colorful graphs may need to be accompanied by your whole software package—and maybe even your PC and you to run it. Squashing your monitor through a printing press to add pictures to your published text is hardly a workable procedure.

Another reason to peel your images off the monitor screen is the fragile and transitory nature of their electronic existence. Your work may require that you preserve your visual results for posterity, yet an erring keystroke, a brief power interruption, or the need to get on to other business may whisk your images into oblivion.

No doubt you can put your on-screen image on paper with a graphics-capable printer, but insubstantial dot-matrix may compromise the intended effect (to impress someone) of your visual message.

And the skinny lines drawn by most plotters hardly do justice to the bold strokes and colors on your monitor screen.

Take heart! There is a way to preserve every color, every line, and every pixel of your on-screen graphics—and it's as easy as pressing a shutter release. That's right—just take a picture of the image on your PC's monitor screen!

Although video enthusiasts have been predicting the demise of photography for years, the more than century-old process is still the best way of capturing the finest detail of every image and putting it on permanent display. A color slide taken from the PC graphic display of a business chart can demonstrate a message to the biggest, most important sales meeting. The same color transparency can be dropped in an envelope and dispatched to your favorite publisher or your best friend in faraway

Tibet. If you really want to be dramatic you can even order a full color print in any size.

To make your off-the-screen photography as quick and easy as possible, several manufacturers have developed specialized cameras, each with the sole purpose of capturing color video images on film. Although every model goes by a different name—"color graphic recorder," "video film recorder," "computer graphics camera," or "VideoPrinter," just to name a few—each works in much the same way and makes similar claims. Each will produce beautiful photographs when connected to the output of your IBM PC. Each one is a complete imaging system that connects electronically to your computer; instead of pointing a lens, you plug in wires. These "screen cameras" (as we'll call them to avoid favoring any one manufacturer) have their own built-in monitors to photograph from, so there's no need to focus and little worry about apertures and shutter speeds.

All of the cameras handle 35 millimeter film, black-and-white or color, for slides or prints. Some (the more expensive ones) also work with large film formats and regular Polaroid and SX-70 instant-film packs.

Every silver lining has its cloud, however, and with these screen cameras, it is their price: The cheapest one costs \$2,495. From there, the prices fly off into the stratosphere: \$10,000 and up.

Though at these prices you are not likely to buy a screen camera for your PC at home, if you regularly prepare graphic

THERE IS
*a way to preserve every
color, every line, and
every pixel of your on-
screen graphics.*

presentations (like audio/visual slide shows) at work or if you need to preserve computer displays in your research or for publication, one of these screen cameras could quickly pay for itself in time and production costs saved.

The Curse of the CRT

The high price of most screen cameras is enough to send you rummaging through your attic for that old camera you haven't used in years. But there's a surprise in store if you think snapping a copy of the Technicolor image on your IBM PC monitor screen is a simple chore. Dig out your old Instamatic, point it at the screen, and click the shutter. Instead of sparkling slides you'll probably get a box full of odd-colored, strangely-shaped snippets of what you saw through the viewfinder—hardly the breathtaking graphic beauty you expected. What could have happened between the screen and your final emulsion? It's simply that you and your camera have a different way of looking at the world in general, and video screens in particular. This is where video cameras justify their high prices. They do an expert job of resolving the difference in perspective between the human and the camera eye.

When you try to use an ordinary camera to photograph a CRT (cathode ray tube or picture tube), results are guaranteed to be bad. Bright on-screen colors are destined to appear washed out on film, layered with glare off the glass of the screen, and tinged with blue. More likely than not, part of the screen image will be missing from the film, and what is on the emulsion will be distorted. (For a different view, see "Photo Replay: Making Slides From Your PC" in this issue.)

The problems are various. From seeing examples of stop-action photographs, you probably know that the camera is faster than the eye, able to freeze motion with the fast snap of its shutter. That's wonderful if you want to freeze the splashing of a waterfall or the trotting of a horse, but disastrous when it comes to video. All video monitors work on a principle similar to magic—that the human eye registers images slowly and can be fooled if things are done quickly enough. Cameras, however, are not so gullible.

Like any television picture, the on-screen image from a PC is not drawn all at once. Rather, it is built from scan lines that trace across the screen over a period of 1/30th or 1/60th of a second (depending on the graphics board you use). Portions of the screen image can be missed by a mismatch between the shutter speed of the camera and this scan rate. If the camera shutter speed is faster than the display rate, part of the picture will display after

the shutter closes, and the complete image won't be picked up by the film.

Slowing the shutter speed can create as big a problem as it solves. Should you use a shutter speed slower than about 1/30th of a second with lenses of normal focal length or longer, you're almost certain to move or jiggle the camera during expo-

THE HUMAN
*eye registers images
slowly and can be
fooled.*

sure. Even slight camera movement can blur photographs or cause distortion of the shapes of the images recorded on film.

Of course, you can solve the camera movement problem by locking your camera in place on a tripod. But then you must contend with additional problems, such as glare from the screen, which can "wash out" important parts of the picture or lower the contrast. Proper lighting can minimize the problem of glare. But then you will have to contend with reflections off the glass of the screen itself. Avoiding all light (take your photos in a dark closet) can eliminate both the glare and reflection problem, but you'll have to fumble for the camera controls in the dark.

Even if you manage to snap away in a closet, your photos are guaranteed to look blue. Most color picture tubes are designed to produce a certain standard color spectrum, which, unfortunately, appears bluish to most films, even though to your eyes the colors look natural. (Scientifically speaking, most color picture tubes are balanced to a "color temperature" of about 6500° Kelvin. Most "daylight" color films are balanced for 5500° Kelvin.) You might think that this off-color problem can be conquered by simply putting a "warming" filter (a reddish piece of optical glass) in front of your camera lens, but it won't. For one thing, the green phosphor will overstimulate the red dyes in the film.

Even if you get the colors right, though, your photographic images will still look distorted because your monitor screen is simply not flat. For an assortment of reasons, the fronts of most picture tubes are

gently rounded. This distortion becomes obvious in photographs.

Another problem that cannot easily be corrected is the limited resolution of most IBM PC color/graphics displays. The quality of the graphics produced by an IBM PC is limited by three factors: the capabilities of the software used to create the images, the graphics board installed in the systems unit, and the monitor screen upon which the image is displayed. Although the limitations of the first two are giving way as new software and graphics boards for the PC are marketed, the quality of color monitors is limited by the physical construction of all "shadow mask" color picture tubes. Foreseeable technology is unlikely to improve on-screen color images at an affordable cost.

In other words, photos of your PC screen are doomed to be blue, faded, distorted, and probably partly missing. The photos you take of a color monitor screen with a normal camera will hardly be professional quality—nothing you'd want to stake your proposal on during a marketing presentation.

The Blessing of the Filter Wheel

Screen cameras solve all of these problems in a clever way: by circumventing the primary limitation factor—the color picture tube. Instead they create a color image from a high quality black-and-white monitor screen. Color filters are inserted between the screen and the film to add color to the image during exposure. Three color filters corresponding to the primary

ter while the green part of the image is displayed, and one through the blue filter when the blue part of the image is displayed. Because a single frame or sheet of film is used for all three exposures, the filtered black-and-white exposures add up to a single full-color image.

Any color mismatch problems are solved by simply varying the exposure time devoted to each of the three primary colors. If the picture looks too blue, the exposure time of the film to the blue filter/blue image combination is shortened.

The resolution problem inherent in photographing an ordinary color monitor is solved automatically because black-and-white picture tubes do not have shadow masks. They have virtually no physical limitation to the quality of their displayed images. (Some of the cameras we investigated used monitors with 1300-line resolution, nearly twice that of IBM's high-resolution color monitor and as good as many 35-millimeter cameras can produce.)

Image distortion caused by curved screens is eliminated by using special (and expensive), flat-faced cathode ray tubes or by using only a small, central portion of a regular tube.

Part of each screen camera is a fixed-focus lens (no focusing adjustment ever need be made), which is held in place pointing at the monitor screen inside a virtually light-tight enclosure. Glare and washed-out color are prevented by the enclosure. Within this self-contained darkroom, exposure time can be lengthened so that all the image is certain to be displayed. In fact, many screen cameras synchronize the opening and closing of their shutters to correspond exactly to at least one full scan of the monitor screen. Long exposures, in the range of a few seconds, also allow for sharper pictures because the brighter the phosphor dots of a CRT screen, the bigger they become. A dimmer image (requiring longer exposure) can therefore be made sharper.

These color-wheel systems can also add extra capabilities to your on-screen graphics.

Some screen cameras can change black-and-white graphics into color. By breaking your graphics into different elements and exposing each element separately through a different color filter, you can make color slides from your monochrome software. For instance, for a bar

chart contrasting the relative sale of three separate items, you could display the chart with one set of bars (and the framework of the chart, the axes and labels) using the red filter. Expose the next set of bars and the same framework using the green filter, and the final set of bars using

**YOUR OLD
Instamatic does have
one advantage over the
expensive screen
cameras.**

the blue filter. On film your three sets of bars will each be a different color, and the framework axes and captions will show up white because they were exposed to all three colors.

Most (but not all) of the screen cameras allow smoothing out the jagged edges of on-screen graphics or filling in between the scan lines of your video images. Nearly all allow adjustment of contrast so that blacks can be blacker and whites whiter. All allow some flexibility in "brightness."

Your old Instamatic does have one advantage over the expensive screen cameras, however. With a separate camera you can make a slide of only a portion of the on-screen image, to focus on a graphic highlight or to crop the frame to suit yourself or your presentation. None of the screen cameras investigated here allow this. They photograph the whole screen—or most of it—and sometimes this can be a problem.

As with any television screen, the aspect ratio of the IBM PC monitor screen is 3:4 or .75; that is, for a vertical measurement of three units, the horizontal will measure four units. The aspect ratio of 35-millimeter film is 2:3 or .667; of 4- by 5- or 8- by 10-inch film, the aspect ratio is (obviously) 4:5 or .80. It is therefore impossible to fit an on-screen video image exactly within the frame of a photograph. Although tastes vary, it's probably better to have all the image on film and leave a little emulsion unused than to lose part of your graphic creation to the arbitrary editing of a camera.

/PC

SCREEN
cameras create a color
image from a high
quality black-and-white
monitor screen.

colors of light—red, blue and green—are shifted sequentially in front of the camera lens. Under control of a microcomputer built into the camera, the exposure is divided into three segments: one through the red filter during which the red portion of the screen image is displayed on the monitor screen; one through the green fil-



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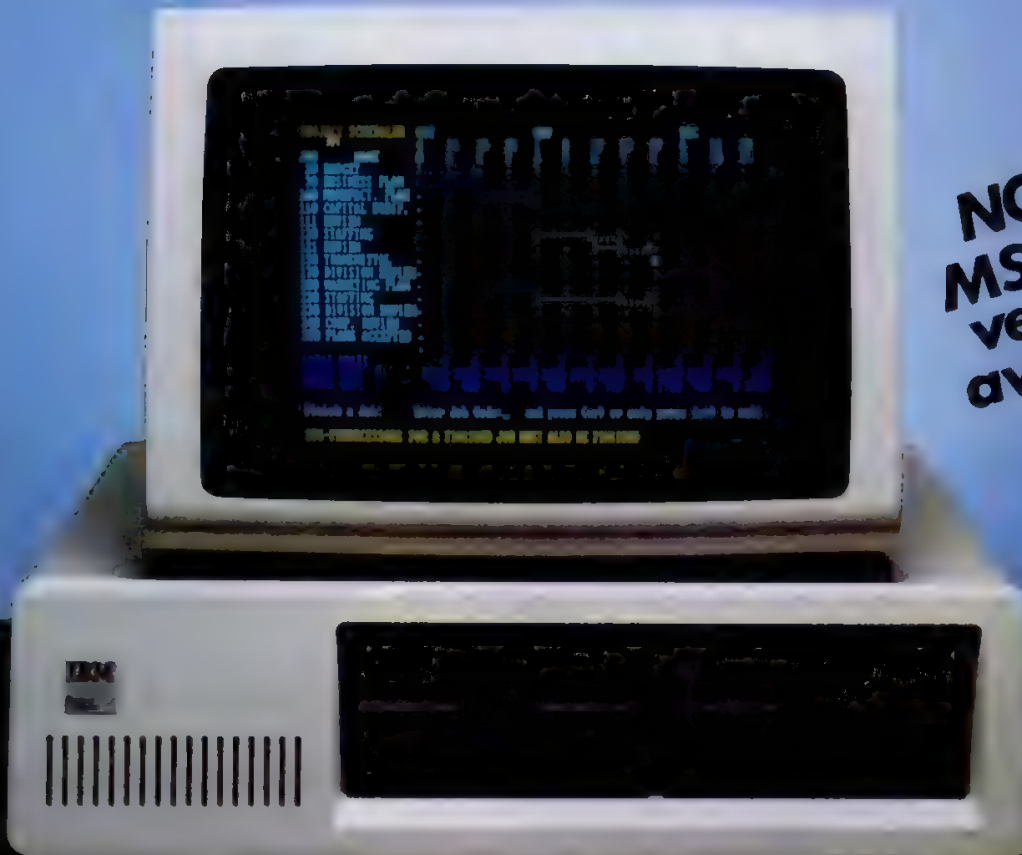
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Illustration of seven cameras reviewed in this article. Top (from left to right): Matrix Instruments Model 4000, Dunn Instruments Model 635, and Image Resources Videoprint 5000. Bottom (from left to right): Lang VideoSlide 35, Celtic Technology VFR-2000-TL-135, Polaroid Corporation Palette, and Modgraph MFR-8.



Two cameras in this crop offer the inestimable advantage of compatibility with IBM PCs straight from the box.

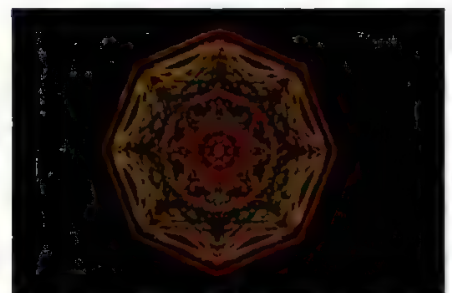
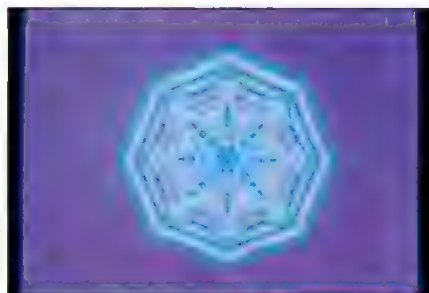
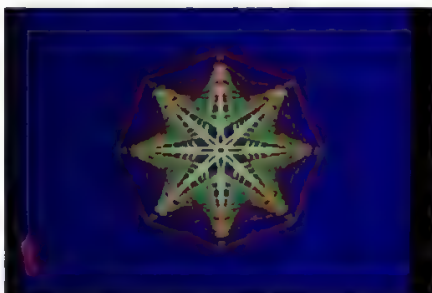
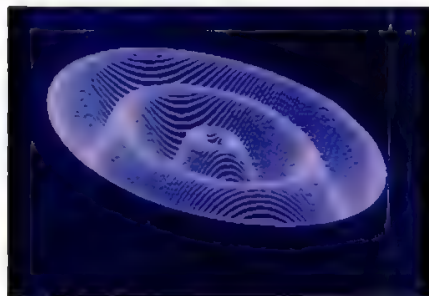
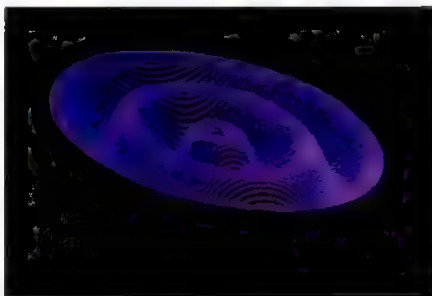
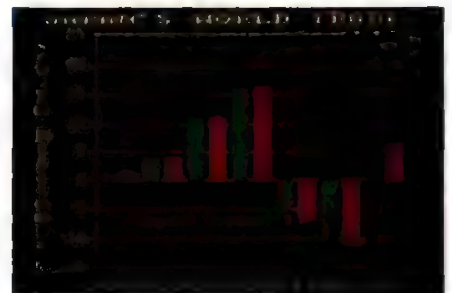
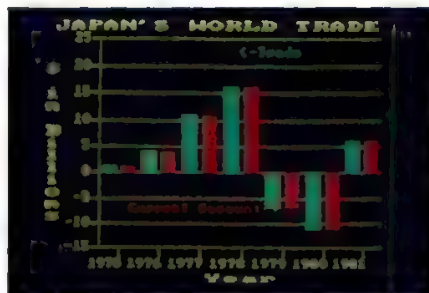
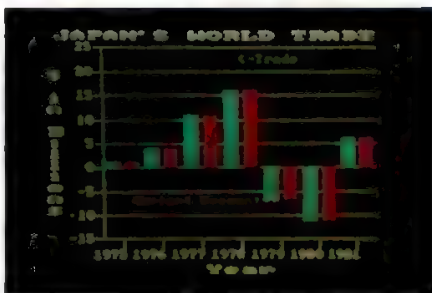
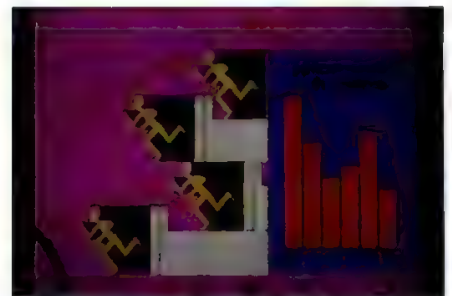
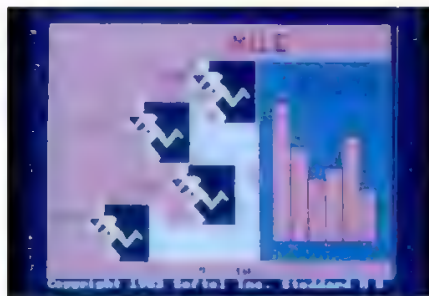
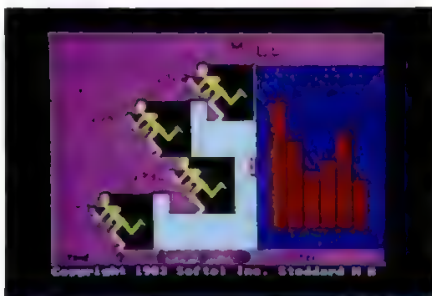
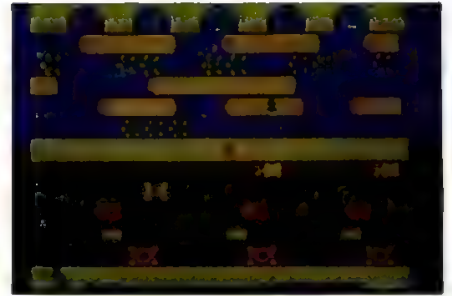
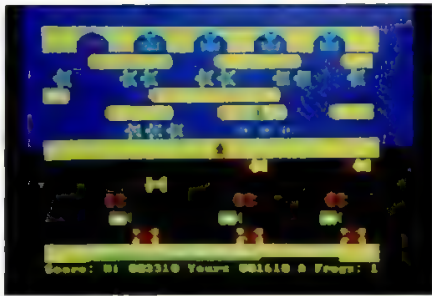
Points Of View: Comparing The Cameras

Ever your faithful servants, we decided to try out the new combination of photography and technology to see what you might expect. In our explorations, we discovered roughly half a dozen different video camera models, and like kids in a candy store, we decided that we had no alternative but to order one of everything.

We made one requirement plain to every supplier: Whatever we received had to be PC-compatible, for obvious reasons. In a few days we had a room full of wonders—wonderful machines ranging in size from smaller than a breadbox to nearly as large as a refrigerator.

With an effort we thought typical of PC-users' capabilities, we had three of the cameras operating in a few minutes. The rest of the testing had us waiting for a color/graphics adapter from Scion so that we could hook up the non-PC-compatible RS-170 inputs that the other cameras used.

Comparison of 35mm transparencies of similar subjects taken by (from left to right) Celtic, Lang, and Image Resources cameras.



We took several rolls of film and were more than a little surprised when we received the results. We had anticipated that the differences we would find would be principally in ease of use, versatility, and PC-compatibility. Because all of the screen cameras solve the immense technical problem of putting a video image on paper in exactly the same way, we figured the images on film would be very similar. They were not. The differences lie in the realization and not in the basic premise.

Working with the Celtic

The Celtic Technology model VFR-2000 "Video Film Recorder" is the smallest and most stylish of the screen cameras we investigated. Smaller than a breadbox, it hides a built-in 35-millimeter camera body and all its controls behind a door on the front of its off-white heavy plastic case. This plastic shell provides most of the support for the camera's internal electronic and optical mechanisms. Removed from its case, the unit has unpromising structural integrity—the chassis flexes and bends, hardly instilling confidence—not that it isn't strong enough to hold together, it's just doubtful that it will maintain perfect optical alignment.

Several consequences follow from the camera body being built into the main body of the unit. Only one film size can be used, standard 35 millimeter. In fact, only two films are recommended: Kodak Ektachrome 64 for color and ASA 125 black-

LIKE KIDS
in a candy store, we
decided to order one of
everything.

and-white film. Nor can the image be previewed through the camera viewfinder. There is no viewfinder. Instead, there is a peephole in the front of the unit. By pressing one of three tiny buttons next to this miniature window-into-the-works, you can see, in black and white, the image made by each of the red, green, and blue signals from the computer.

The model VFR 2000-TL135 comes equipped with a 9-pin "D" connector, fully compatible with the output of the IBM

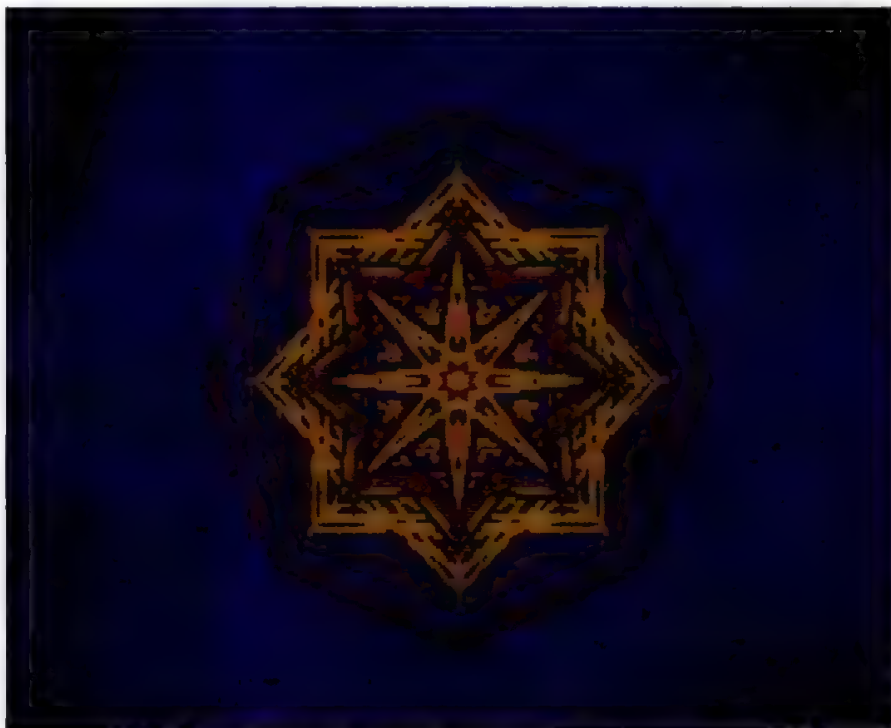
Analog Cameras: A Breed Apart?

The PC is, of course, a digital machine but with the right tinkering, you can hook it up to an analog camera.

There are two major ways for computers to deliver a color signal to a monitor. The one most familiar to PC users is TTL, which stands for transistor-transistor logic. It signifies the industry-standard voltage at which integrated circuits communicate with one another. There are five significant signals that come from the color-graphics adapter, one for each primary color and one each for horizontal and vertical synchronization. TTL signifies that the color lines are being switched on and off rapidly, in time with the synchronization signals.

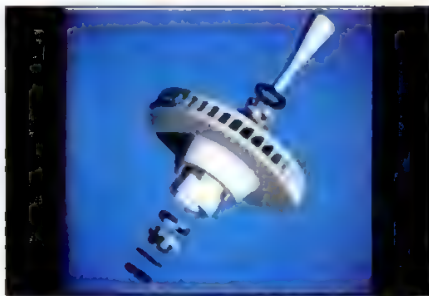
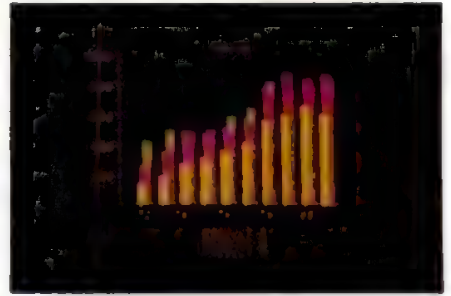
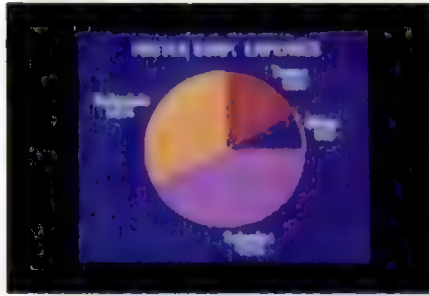
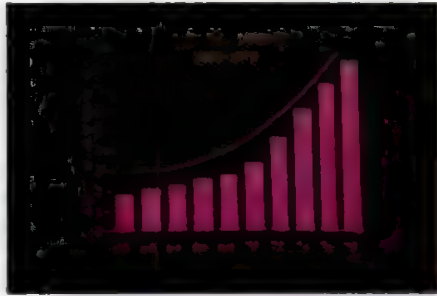
Analog color, on the other hand, uses a high-speed analog signal (The level of the voltage is part of the information, not just whether it is present or not.) to convey the color image. As with TTL, there are three signal lines. There may be a separate line for synchronization or the sync signal may be "piggybacked" onto the green signal. "Sync on green" is a common mode of operation. There is a standard that defines this style of video interface: RS-170. The nature of the analog signals requires that each be carried from the computer to the camera in its own coaxial cable. For a variety of reasons, RS-170 is the prevailing standard in the industry. First, the "bandwidth" or ability to encode data is relatively unlimited. Second, analog techniques have been in use in the broadcast industry from the beginning, while TTL is new and untried by comparison.

Several of the cameras we collected for this test were designed for analog input: the Matrix, Modgraph, and Dunn. We also tested Lang's Videoslide 35 with its optional RS-170 interface board. We drove these cameras with Scion's PC640 Color

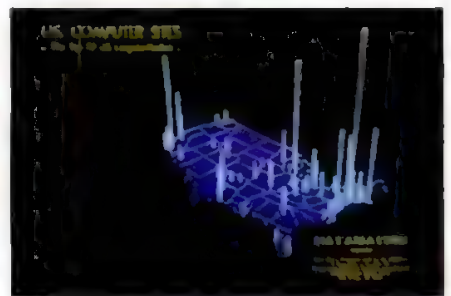
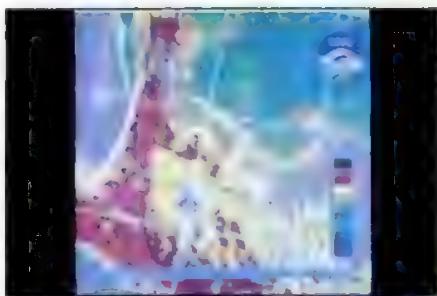
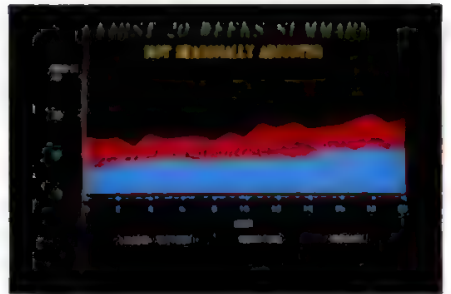


4- by 5-inch transparency taken by Image Resources camera.

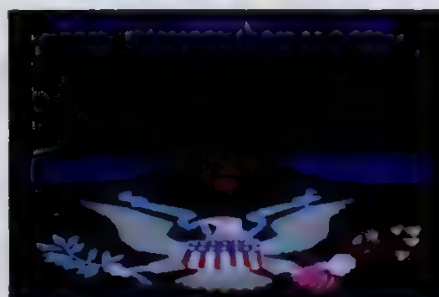
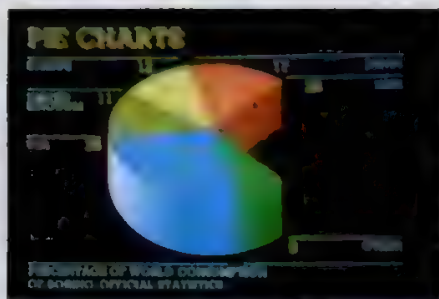
35mm transparencies taken by Polaroid Corporation Palette camera.



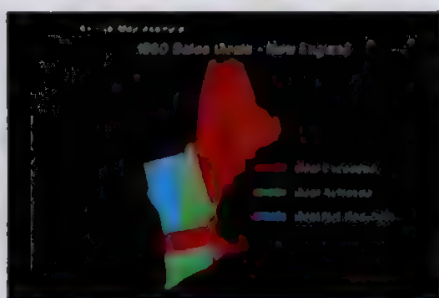
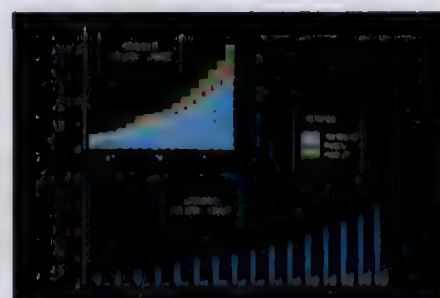
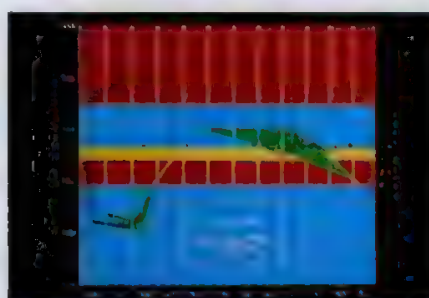
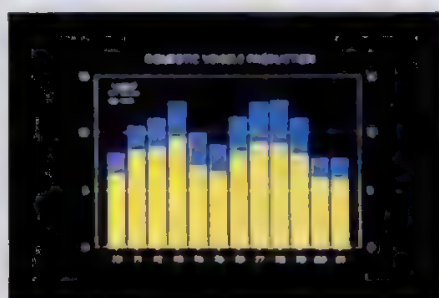
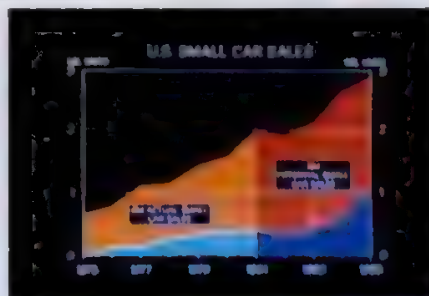
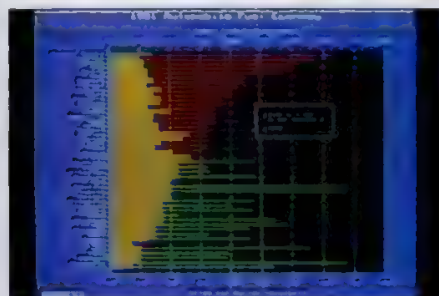
35mm transparencies taken by Modgraph MFR-8 camera.



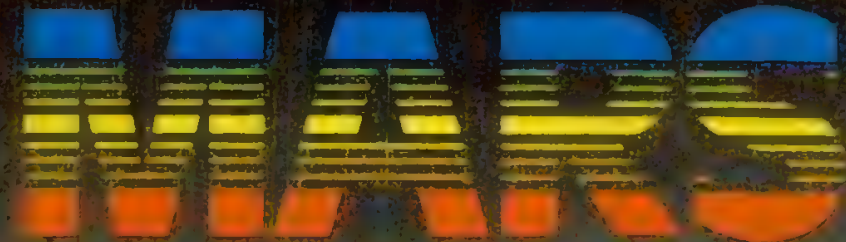
35mm transparencies taken by Dunn Instruments Model 635 camera.



35mm transparencies taken by Matrix Instruments Model 3000 camera.



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Graphics System and Control Systems' Artist 1 board. Both output RS-170 signals. These boards offer significantly greater graphics capability than IBM's standard board.

Customized Cameras

The technicians at Modgraph built an RS-170 to TTL adapter for us so we could test the camera with the standard IBM color board. Unfortunately, IBM was less than helpful in providing the technical information they required to get the sync signals straight. They built the interface anyway, and it was only partially successful. When they brought it to our offices, we gave them copies of a few pages from IBM's Technical Reference manual, which had all the information they needed to build it right.

Once we set up the Scion card for sync on green operation, we were able to drive all the RS-170 cameras. The Videoslides 35 was the easiest to operate, having only one control. The Matrix was next to impossible to operate, given its complex, menu-driven setup mode. The Modgraph was close to the Videoslides 35 in simplicity. It is much easier to fine-tune the Modgraph, since the controls are accessible from the outside, behind a cover plate. Videoslides' adjustments are inside under the cover or on the back of the machine. The Matrix controls are all on the front panel, in the form of a myriad of pushbuttons. Modgraph's preview system is the best of the

were never in our offices at the same time. Its features are impressive, as it offers everything from 35mm to 8×10 for image recording. We also didn't have an oppor-

YOUR COMPUTER
*is far and away the
most limiting factor on
the resolution of the
images you produce.*

tunity to test Image Resources' camera in its native RS-170 mode.

Both the Modgraph and Matrix units are tank-like in construction, with thick aluminum panels, heavy bases, and many screws. They have massive machined collars and registration pins to ensure proper location of the interchangeable cameras and film backs. Internally, the wiring and components are top quality and very rugged. Both use the Tektronix 634 flat-screen high resolution monitor. Each, however, has proprietary timing and exposure controls. The Dunn camera is no less rugged, but somehow seems less "polished" than the others. The Lang camera is remarkable for its simplicity, while no less effective for most 35mm purposes.

None of the recorders we tested had any difficulty handling the higher resolution of the analog boards, since they still don't come close to the cameras' limits of resolution. This is almost humbling, when you consider the quality of the images we were producing. But then, we're not JPL displaying Saturn's moons, nor are we General Motors designing a new bearing. The bottom line here is that your computer is far and away the most limiting factor on the resolution of the images you produce. Choice among the cameras comes down to the features you need or want and the price you can afford to pay.

Among the RS-170 recorders, I prefer the Videoslides 35 for its ease of use and the Modgraph for its flexibility. The Image Resources camera proved quite flexible in its TTL mode and is likely to be much the same with RS-170 inputs.

—Bill Machrone

color/graphics board. The camera is connected to the computer; then the IBM color monitor is plugged into an output of the camera. According to the preliminary instruction manual we received, any number of cameras and monitors can be linked together in this way. However, when we tried to "daisy-chain" several of the cameras we wished to test, the Celtic did not take to it very well and its screen image started to roll, like the loss of "vertical hold" on a television set. Possibly, the Celtic is more sensitive to ground loops and other conditions on the signal lines than are the other cameras.

The biggest problem we had was loading the film. The preliminary manual did not tell us that a button we had to press to operate the film transport was hidden underneath the front edge of the camera. Once we solved that mystery, we had no further problems moving the film. Both winding and rewinding is automatic, and a "beep" indicates when a frame passes through in either direction.

Using the camera is simple. You make an exposure by pressing a large, green pushbutton. The camera beeps after it finishes each exposure of each of the three primary colors. This pushbutton illuminates when the camera is ready to take a picture. Four controls, normally hidden behind the door that accesses the film transport, allow "fine tuning" of the brightness, contrast, color and "jaggedness" (how much the raster lines of the video image are smoothed) of the image.

THE BIGGEST
*problem we had was
loading the film.*

To ascertain the degree of control afforded by these adjustments, we took separate exposures with each control rotated 90 degrees. The differences were hardly perceptible. In fact, rotating the brightness control fully in either direction only changes the exposure by one f stop—with today's films, a barely noticeable difference.

The slides we took had bright, saturated colors that were true to what we saw on

ANALOG
*techniques have been in
use in the broadcast
industry from the
beginning.*

lot, since you can open a slide and swing back a front-silvered mirror to view the monitor directly. The others require that you remove the camera back or peer through the viewfinder of the 35mm back.

We never got to test the Dunn recorder, since it and the analog graphics boards

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the PC monitor screen—except for one slide, in which all the colors were washed out for no apparent reason. On each slide the vertical image was slightly smaller than the cardboard slide mounting; this means everything on the screen made it onto the slide. (Because slides are more rectangular than video screens, the images

THE IMAGES *suffered from noticeable geometric distortion.*

made by each camera lie well within the horizontal boundaries of the cardboard mounting.)

The images were not perfect, however. They sloped off to the right. And they suffered from noticeable geometric distortion; they were slightly trapezoidal. This results in squares that aren't square and circles that aren't perfectly round. The aberrations were minor, and should be acceptable to those not demanding absolute perfection.

Lang VideoSlide 35

The Lang Systems, Inc. VideoSlide 35 "color graphics camera" appears to be the easiest to operate of the screen cameras. At least it has the fewest controls! The front has only two switches: a rocker switch to turn the power on and a pushbutton to make an exposure. Three thumbwheel switches, located on the back panel, which allow adjustment of the exposure times through each of the three color filters, complete the available controls.

A normal-looking 35-millimeter camera is permanently mounted on the front of the unit, limiting the choice of film to that one format. Looking through the camera viewfinder gives a preview of an image—but only the red image seen through the red filter. A motor winder built into the base of the unit gives the only indication that the exposure is complete. The film winds automatically; rewinding, however, is a manual operation.

Several interfaces are available for connecting the Lang to a variety of image sources; the unit we received used what

Lang calls "TTL RGB," which plugged directly into our IBM PC and color monitor in the same manner as the Celtic.

Lang recommends that Eastman Kodak Ektachrome 200 film be used, but concedes that Ektachrome 64 and Kodachrome have also been used successfully. To eliminate possible outside influence on our test results and to ensure consistency, we chose to use a single variety of film from a single emulsion batch. Because all the other screen cameras were compatible with Ektachrome 64, we standardized with that.

It was not the best choice for the Lang. With the factory's recommended settings for that film, the exposure time was unbearably long, about 50 seconds. Nor was the recommended combination of exposure times through the different filters acceptable. All the images were obviously blue because every color was tinged with blue, including the black of the backgrounds. Some adjustment for this off-color result can be made with the back panel thumbwheel switches, but because the adjustments are incremental and not infinitely variable and because no "fine tuning" controls are available, colors cannot be "tweaked in" perfectly by a casual user. We also found that the location of these controls on the back panel of the rather long unit was inconvenient.

The entire on-screen image fit tightly within the boundaries of the cardboard slide mounts. The horizontal lines in the images were properly aligned parallel to the edges of the film. A slight amount of geometric distortion was apparent, though not quite so much as with the Celtic. All three colors of the images appeared in perfect registration, one directly over the other without color shadows. However, the two edges of the image showed obvious differences; one side had a bright border, the other a dark border.

Image Resource (aka Polaroid)

The Image Resource model 5000 "VideoPrint" closely resembles the Polaroid model 4 "VideoPrinter instant color-film recorder." In fact, according to Lee Benedict of Image Resource Corporation, the model 5000 is "an earlier version of the Polaroid model 4."

The model 5000 came to us specially modified to plug directly into the IBM PC. The camera is not normally supplied with

a compatible RS-170 interface.

It is extremely versatile and will handle 35-millimeter film rolls, 4- by 5-inch sheet film, and Polaroid SX-70 film packs, depending on the adapter that is attached to it. Not only will VideoPrint capture color images of color graphics, it can also turn black-and-white graphics into color on film. Its versatility allows it to be programmed to make multiple prints as well as handle a dizzying number of other functions. Nevertheless, using it can be as simple as pressing a button. Light emitting diodes (LEDs) and flashing lights indicate each individual color exposure and signal when the camera is finished with a shot. A multidigital numeric LED display indicates how the multifunctions have been programmed.

With all this gadgetry, you might expect an autowinder as a standard feature on the Image Resource 35-millimeter film transport (well, okay, a modified Yashica camera). After all, winders are standard on all other screen cameras we tried. A winder does not come standard with the Image Resource, however. Several times we were disconcerted to discover that the film had not been wound. (Perhaps our error, but we're all in favor of error-prevention.) Strangely, too, in the first box of slides we received back from the lab, the edges of two frames overlapped, indicating improper advancing of the film. None of the autowinders demonstrated this problem.

We tried this camera (it's big, heavy,

ONE SIDE *had a bright border, the other a dark border.*

and sturdily made) on both 35 millimeter and 4 by 5 sheet film, both Kodak Ektachrome 64. The 4 by 5 quality impressed us; the 35 millimeter appalled us!

The 4 by 5 images are almost impossible to fault. Sharp, saturated colors. Black is really black. No visible geometric distortion.

The 35-millimeter images abounded with problems. The image extended beyond the limits of the frame, so the periph-



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ery of the monitor screen did not appear on the slides; the horizontal lines in the image were not parallel to the edge of the film (more severely tilted than on the Celt-

SEVERAL
camera makers implied that IBM's insistence on a separate standard was obstinate.

ic); and a black curved line crawled across the bottom left corner of every slide, as if a wire were dangling loose in front of the camera. On the positive side, however, the colors were as bright and as saturated as on the 4 by 5 film, and no geometric distortion was perceptible. All the problems with 35-millimeter images we cited are due not to problems in the design of the VideoPrint unit but in the physical adaptation of the outside supplier's 35-millimeter camera to it. Still, for \$7,000 you would expect a little more attention to detail.

PC Compatibility

All the screen cameras investigated here have RGB inputs, which means that they use a separate wire to connect each of the primary colors, just as with the PC color monitor. For the color monitor, the separate color channels are bundled into the one cable that plugs into the 9-pin socket on the IBM color/graphics adapter card. Separate RGB lines is the method most often used to transfer the highest quality color signals.

Some cameras also accept normal NTSC color signals, one-wire video like that from a videocassette recorder or the video connector (the one with one big central pin) on the PC color/graphics card. Using NTSC signals will severely degrade the color picture performance of a monitor or camera.

Although RGB connections assure high quality, in the case of the IBM PC it can also mean problems because the IBM PC does not have an RS-170 output. RS-170 is the interconnection standard for RGB signals. In some ways this is a reason to give

thanks; RS-170 specifies three or four separate cables with expensive connectors on each end. Using one cable, as IBM does, simplifies interconnection with the color monitor and keeps the cost of cables within reason. Although several camera makers we spoke with implied that IBM's insistence on a separate standard was

obstinate, in truth, RS-170 is an analog video standard, and the PC outputs are strictly digital (TTL) signals.

Not only are the interconnection cables different, but the PC uses nonstandard signals inside its wires, too. Its synchronizing signal, for example, is inverted compared to the video industry norm. And

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IBM adds an extra signal to indicate bright or dim on-screen images that the RS-170 standard does not provide for.

The bottom line is that by itself (as well as with most color/graphics adapters from outside vendors), the IBM PC is not com-

patible with RS-170. If a screen camera has only RS-170 inputs, there is no convenient way to plug a PC into it. Using a "composite video" or NTSC connection between those cameras and the PC will degrade picture quality.

The manufacturers who provided cameras to be evaluated for this article were told that the hardware tests would be done using an IBM PC. As received, however, most of the screen cameras could not be plugged directly into a PC.

Screen Image Camera Features

Camera Manufacturer	Celtic Tech. 6265 Variel Ave. Woodland Hills, CA 91367 (213) 884-6767	Dunn Instruments P.O. Box 77172 544 Second St. San Francisco, CA 94107 (415) 957-1600	Image Resource 2260 Townsgate Rd. Westlake Village, CA 91361 (805) 496-3317
For more information circle reader service card number	#690	#689	#688
Model Number	VFR-2000-TL-135	635	Videoprint 5000
Controls: Brightness Contrast Raster fill Color or chroma	Yes Yes Yes Yes	Yes Yes Yes Yes	Yes Yes Yes Yes
Exposure Time 35mm, ASA 64	14 sec.	NA	15 sec.
Film Formats	35mm only	Has built-in auxiliary port adaptable to any format	35mm; 4×5 inch, Polaroid back available
Interface: Directly PC-compatible?	Yes	RS 232 interface (RG13) video output	No ²
Preview	Peephole	Through camera	Viewfinder (35mm) or groundglass (4×5)
Automatic wind (35mm) Automatic rewind (35mm) Color from black and white	Yes Yes Yes	Yes No Yes	No ³ No ³ Yes
Special features		Very user-interactive Powerful diagnostics in software Z80-based microprocessor controlled	Programmable multiple exposures; many other programmable features
List price	\$2,495	\$12,950 (for combination 35mm and 8×10 formats)	Approximately \$7,000

Notes: The resolution of all units is better than the graphics output capability of a standard IBM-PC. All units have video frame rates and horizontal sweep rates compatible with the PC. All units have frame counters (Celtic is electronic) and operate on standard "house current."

¹Brightness and color can be altered by changing thumbwheel control (on back of camera) for exposure of each separate color to vary color mix and total exposure.

²RS-170 interface standard; unit tested modified by manufacturer to be PC-compatible.

³Motor drive for 35mm available as option; not present on unit tested.

Two of the screen cameras (Lang and Celtic) were directly compatible with the PC straight out of the box. They connected simply by plugging a cable into the color/graphics board 9-pin output (into which the monitor cable would normally go),

then plugging the monitor input cable into a connector on the camera.

The Image Resource had been previously modified by its manufacturer (at the special request of *PC Magazine*) to be PC-compatible. Straight from the box, howev-

er, the Image Resource camera uses an RS-170 interface. Other video cameras with varying capabilities can be adapted to the IBM PC. To learn about these, see the sidebar entitled "Analog Cameras: A Breed Apart?" */PC*

Lang Systems, Inc. 1010 O'Brien Dr. Menlo Park, CA 94025 (415) 328-5555	Matrix Instruments 230 Pegasus Ave. Northvale, NJ 07647 (201) 767-1750	Modgraph 1393 Main St. Waltham, MA 02154 (617) 890-5764	Polaroid Corp. Industrial Products Division 575 Technology Sq. Cambridge, MA 02139 (617) 577-2000
#687	#686	#685	#684
VideoSlide 35	3000	MFR-8	Palette
No ¹ No No No ¹	Yes Yes Yes (switch selectable) Yes (exposure ratios)	Yes Yes Yes Yes	Yes (programmable) No Yes Yes
50 sec.	Less than 10 sec.	15 sec.	Variable (under software control)
35mm only	35mm, 35mm tin reg., SX-70, 4×5, 8×10, 16mm	35mm, 4×5, SX-70, Kodak PR-10, 8×10	35mm, 3¼×4¼
Yes	Requires RS-170 interface	Requires RS-170-type signal. Manufacturer provides interface module for compatibility	Yes
Viewfinder, image red filter only	Peephole	Screen viewable with module installed	No
Yes No No	Yes No Yes	Yes No No	Yes No Yes
	Utilizes own monitor electronics Storage buffers for different film formats FCC approved Upgradable to higher resolutions Utilizes CRT with 1400 lines—Tektronix	Folded optics minimize console dimensions Can switch from PC to other RS-170 systems Utilizes Tektronix CRT	Software controlled Menu driven Other options available through drivers on selected graphics software Batch processing programmable for both manual and automatic cameras
\$2,599	\$10,000-\$12,000	\$9,000-\$11,000	\$1,300 (includes 35mm Polaroid auto process hardware for rapid access 35mm slide production)

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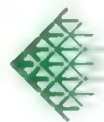
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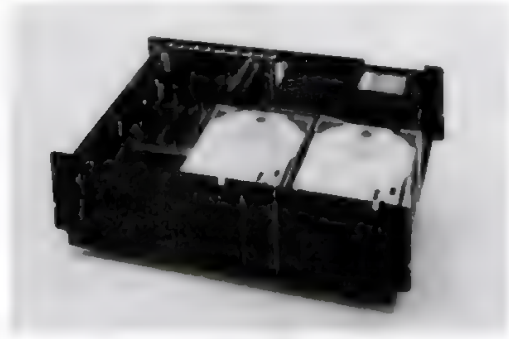
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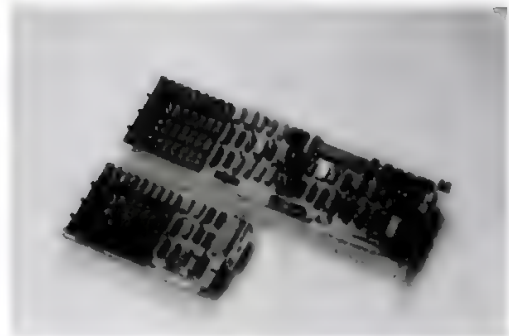
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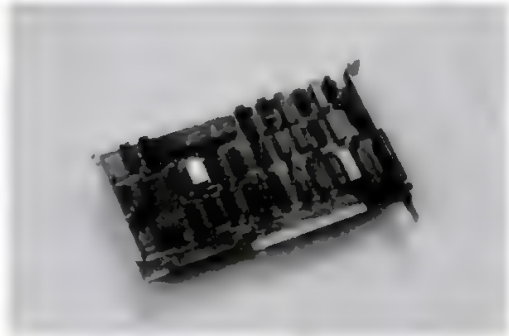
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Do you need a dozen slides for tomorrow morning's presentation? Disaster? Not necessarily. If you have a 35mm SLR camera, a tripod, and a fairly good eye, not to worry.

Photo Replay: Making Slides With Your PC

One of my chores as a university faculty member is the preparation of talks and lectures, sometimes with only a brief notice. It is unusual today to give a talk, lecture, or scientific presentation without the support of 35mm slides; a carousel projector is always available to a speaker as a matter of course. Slides not only present information, but also serve as a cueing device, freeing the speaker from having to use notes or read from a manuscript.

Recently I had to present an hour-long talk that had been incorrectly scheduled for "next" month and which, at the last minute, turned out to be for "this" month. I had to have some slides—a lot of them—in a hurry. There wasn't time to go to our photography department to have them made. You've seen the cartoon that shows the little man doubled up in a paroxysm of laughter; he's saying, "you need them when?" One of those cartoons is on our photography department's wall, just above the reception desk.

I usually compose my slides on the PC screen with WordStar, then print them out as letter quality copy, to be copied and made into finished 35mm slides by our photography department, a process that takes a week or more. This time, because

of the foul-up in scheduling, I decided to try to copy the slides directly from the monitor onto Ektachrome film, which can be processed locally in about 3 hours.

I soon found that slides—and reasonably good ones, at that—can be made

***I'VE FOUND
that it is easier to move
the display than it is to
move the camera.***

using the PC. The result is certainly not as good as slides made either by purely photographic techniques or by dedicated computer-generated slide copiers (megabucks!). The slides are quite acceptable for most purposes, however, and they are certainly quick and easy to make. Many amateur photographers have all the equipment needed.

Here then are some hints on making inexpensive computer-generated slides, some notes on equipment, on calculating

proper exposure, and observations on different types of film.

Equipment and Alignment

A 35mm single-lens reflex camera with manual controls, a good sturdy tripod, and a cable release are necessary. Exposures are long; they must always be more than $\frac{1}{30}$ of a second or the sweep of the electron beam across the cathode ray tube will show up on the slide. The camera should be placed on a tripod and fixed securely enough that each time a leg is inadvertently kicked the entire setup does not have to be repositioned.

The camera also has to be checked visually to be certain that it is level. A ground glass or tissue paper can be used at the focal plane with the back open and the camera unloaded to check that the image is straight, although this is the hard way to check alignment. This is important because, strangely, the view as seen through a SLR viewfinder may be slightly canted from the way that the image is actually projected onto the film. Although this does not seem to make a whole lot of difference in projection, the slide contents may look noticeably slanted.

The "normal" 50mm lens that came

with the camera is not adequate: It just doesn't focus close enough, so some type of accessory lens is required. This may take the form of a screw-on close-up lens attachment for the 50mm lens (although this places the camera awkwardly close to the screen), a macro lens (the longer the better—some zoom lenses with macro capability will work well, also), or a teleconverter to convert the standard lens to a 100mm lens with close-up ability. An even better choice, if available, is to use a longer than normal lens (I use a 135mm) plus the teleconverter. This permits me to place the camera behind my chair so that I can sit down to adjust the display. I've found that it is easier to move the display than it is to move the camera. A bit of experimentation will show you just what your close-up capabilities are, given the equipment available to you.

Film

Almost any type of film is suitable. I prefer Kodachrome 64, as I use it for all my medical photography (plastic surgeons take pictures of almost every patient), but Ektachrome is certainly just as good and,

as noted, it can be processed quickly if time is important. In the very near future, "instant" 35mm slide film is due to be released by Polaroid in both color and

FORTUNATELY,
*since only two values—
one relatively bright, the
other black—are being
registered on the film,
there is a fairly wide
latitude for exposure
settings.*

high-contrast black and white. If these films live up to expectations, they will offer the ultimate capability for making slides on brief notice—just a few minutes before a presentation, if necessary.

If you use color slide film you will find

that the green on black of the IBM monitor projects very well. Color may be shifted toward blue by using a film such as Ektachrome 160 Tungsten, which has a built-in blue bias. You may find the blue a bit more peaceful than the monitor's unrelied Kelly green, which is faithfully reproduced on daylight film. The really adventurous may want to try color negative film, such as one of the Kodacolors, where the color is reversed.

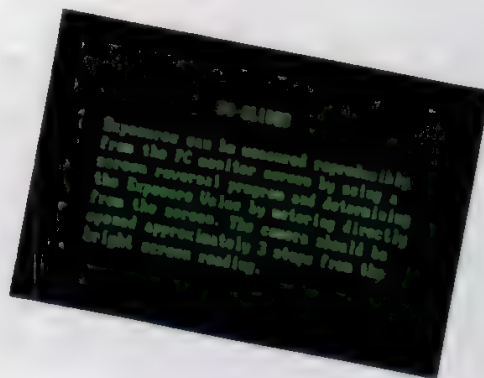
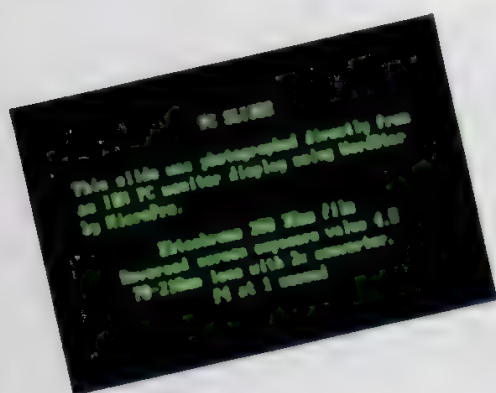
Readers with darkrooms may also want to try high-contrast black and white film. The negative, used directly as the finished slide, will have black characters on a clear background. This combination may seem rather unimaginative, given the extent to which many slides today have been gussied up with vivid color and graphic effects, yet there are those who believe that all slides should be projected with black print on a white background for maximum clarity and minimum distraction.

Exposure

The biggest initial problem in copying slides directly from a monitor is in the

Projecting A Good Image

This short PC photographic primer was reproduced from slides provided by the author.



determination of an acceptable exposure. Fortunately, since only two values—one relatively bright, the other black—are being registered on the film, there is actually a fairly wide latitude for exposure settings.

The simplest method of determining proper exposure is to use trial and error

I ALSO
*suggest that a minimum
setting of f/4 be used,
even though your lens
will permit larger
openings than this.*

and bracket a number of test exposures to determine which one is most satisfactory for your own equipment. This works just fine, but be sure to record all settings both

on the camera and on the monitor (a tiny sliver of colored tape on both the brightness and contrast knobs and matching ones on the body of the monitor will allow future reproducibility). Monitor brightness should be adjusted to the point where there is good resolution of the characters with minimum haloing about them. Too high a setting makes for poorly defined and "blobby" characters with color-contaminated backgrounds.

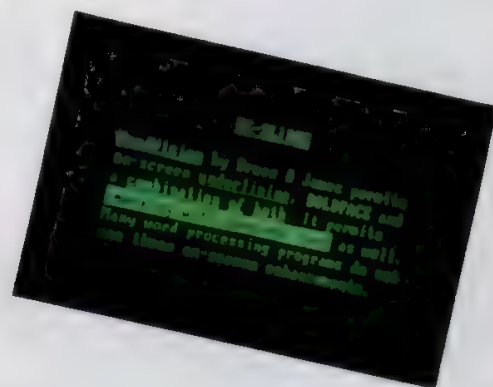
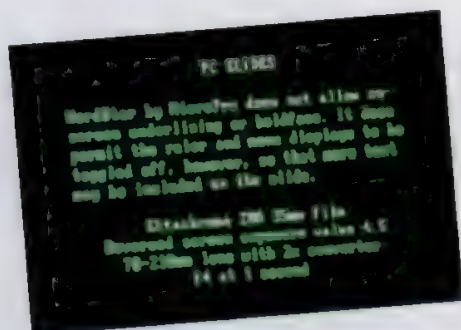
The methods that I use to determine exposure may also work for you and has the advantage of being completely reproducible without the need for bracketing. This involves reversing the screen. (See the program submitted by Christian du Lac "User to User," PC, Volume 1 Number 9). Some utility programs also have this. I use the screen reversed program on the Norton Utilities for DOS 1.1.) I have added a screen reversal program to my WordStar disk so that I can call it up any time I want to take an exposure reading.

Using a hand-held exposure meter (the one in the camera will do, but may be hard to read), the screen is then set to a known value. I use an exposure value of 5 or 6 for

the reversed screen reading. This reading, taken from the bright screen, will be about 3 stops too bright, so the lens should be opened this much beyond the value indi-

AWORD
*processing program is
not absolutely
necessary, but it does
make slide composition
easier.*

cated. For example, a typical reading on the reversed screen might indicate an exposure value of 6, which translates to f/4 at 1/6 second; opening 3 stops will give f/4 at 1 second (the slowest time on many cameras; beyond this may require the B setting, counting off seconds of exposure). This setting, incidentally, is probably as good a starting place as any for a fairly dim



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screen if you are going to use the trial and error, guess and bracket method. It will probably give reasonable results even with moderately slower or faster film.

If exposures are made with an automatic camera, there may be a lot of discrepancies in brightness from slide to slide, depending on how many characters are on screen to affect the metering, so the manual mode should always be used. I also suggest that a minimum setting of f/4 be used, even though your lens will permit larger openings than this. Depth of field is very small in close-up photography, and edges may be out of focus at faster settings.

Composition

You may find that it helps to have the room lights on in centering the slide in the camera viewfinder; the light will make it easier to see the edges of the viewfinder frame. The actual exposure should be made in a darkened room to avoid reflected highlights on the screen. These may not be obvious during composition,

but will show up later on the slide.

A word processing program is not absolutely necessary, but it does make slide composition easier. WordStar has

I HAVEN'T
*figured out how to get
rid of the flags and the
cursor, but they're not
all that much in the
way.*

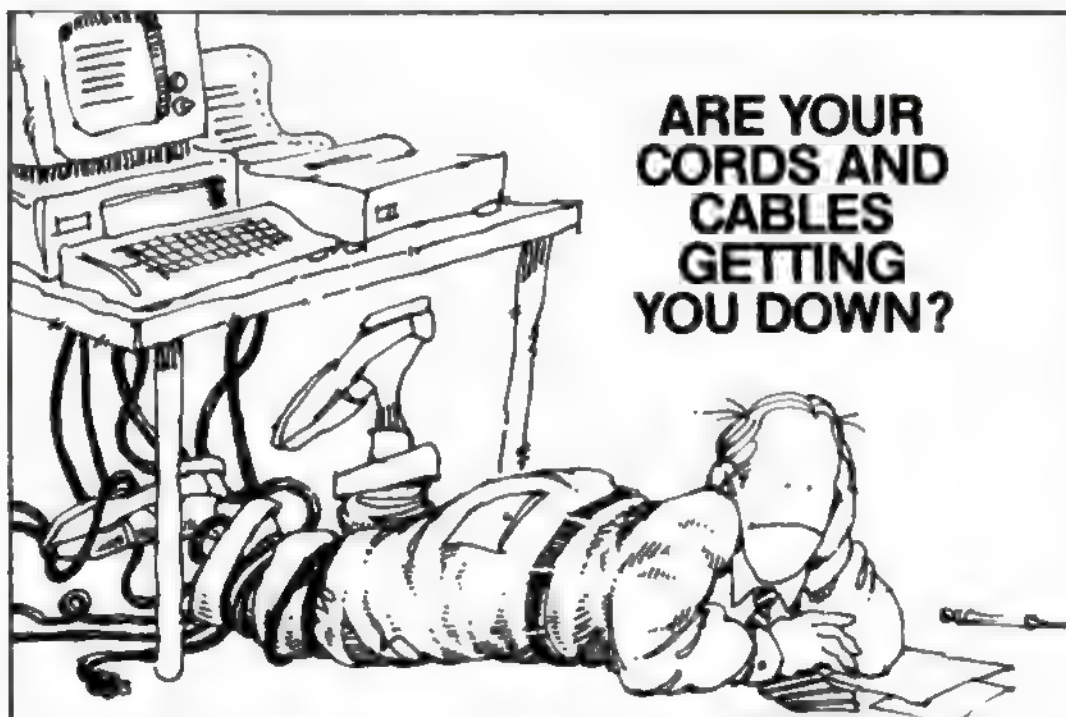
advantages and disadvantages in preparing on-screen slides for reproduction. For example, it is possible to toggle almost all the extraneous material—including the Help menu and the ruler line—off the screen. I haven't figured out how to get rid of the flags and the cursor, but they're not

all that much in the way (just don't forget to hit Home to push the cursor up and out of the way before making the exposure). On the other hand, WordStar won't allow screen-visible underlining and boldface and these are nice to have in composing slides.

Last Words

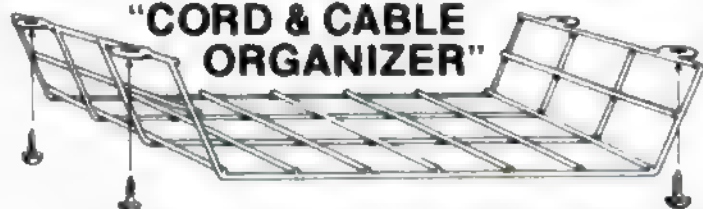
I recently had the opportunity to work with the soon to be released Bruce and James WordVision program. This program gives excellent flexibility, with both on-screen underlining and boldface capability, but the ruler line and menu intrude if the slide covers much of the screen. This would be an excellent program to use for slide composition if these program aids could be toggled out.

A bit of experimentation will allow you to photograph whatever is on your screen. If you're into color graphics your imagination is the limit. Slides are easy to make and can be used for many purposes: to enhance home slide shows or for business or scientific presentations. /PC



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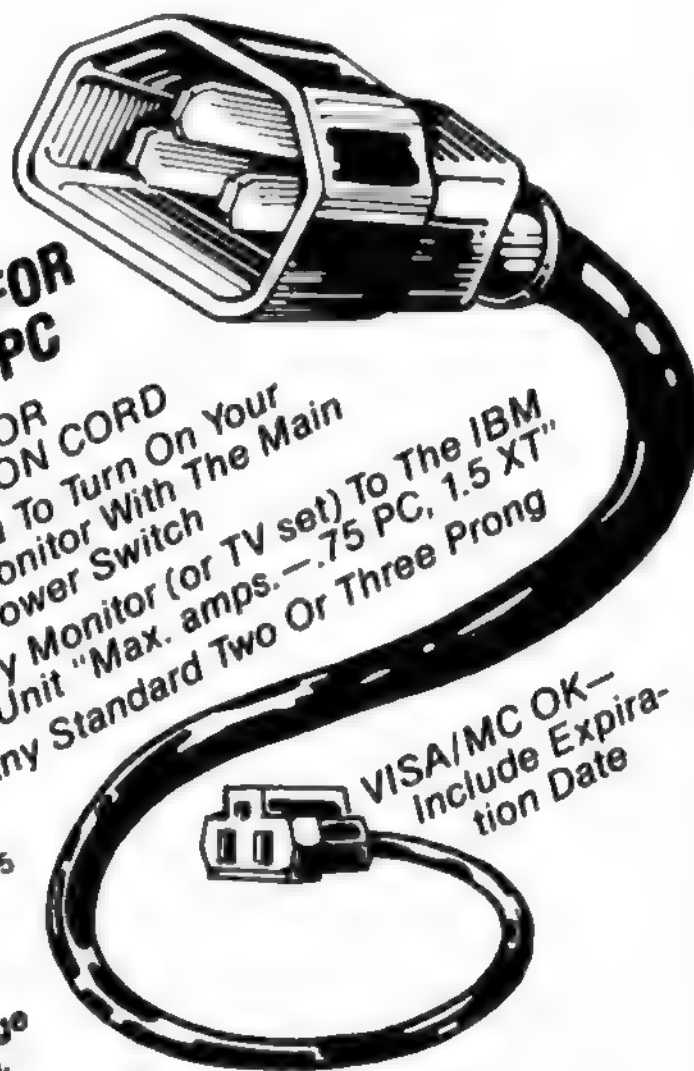
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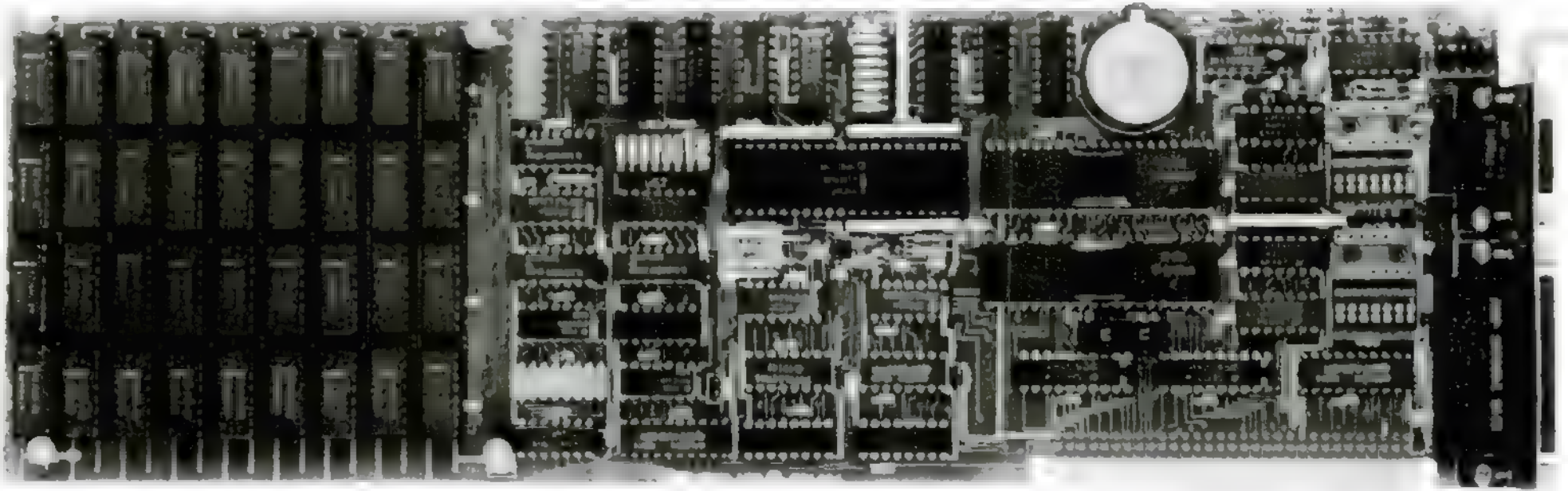
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The PDI464 features six separate functions — expansion memory, two asynchronous serial channels, a real-time clock, a disk emulator, and a print spooler. Together with its high quality, the PDI464 offers a price-performance ratio that is tough to beat.

The memory section of the PDI464 provides up to 256KB of fully socketed expansion memory with parity generation and checking. Four memory sizes are available from 64 up to 256KB to meet a variety of needs. Regardless of memory size ordered, each PDI464 is tested with a full complement of 256KB of memory to ensure trouble-free future expansion. Disk-based memory diagnostics are included which can test memory integrity and report problems down to the chip level.

Two asynchronous serial channels are provided which are completely compatible with IBM serial channels. Each channel can be selected to reside at one of four addresses to allow for future expansion. A unique feature is provided which allows simple selection of data terminal or data communication equipment [DTE/DCE] configurations, thus eliminating the need for special cables or null modems. Each channel comes complete with a 6 foot RS-232 cable.

The Real-Time Clock section features quartz-crystal control and lithium battery back-up to ensure years of trouble-free operation. The RTC features hours, minutes, seconds,

day-of-the-week, date, month, and year with automatic leap year adjustment. Software is provided to initialize system time and date information automatically upon power-up.

p-Disk™, a disk-emulation package provided with the PDI464 allows memory to be treated as an ultra-fast disk drive. p-Disk™ can be configured as a single or double-sided drive and can appear as drive B, C, or D. p-Disk™ does not require modification or patching of the BIOS or DOS files on system diskettes and is fully compatible with IBM software and diagnostics.

A background printer spooler is included with the PDI464 which allows files to be printed on a printer while other software is being used in the foreground. The spooler offers features such as menu-selectable configuration, multiple copies, and upper case options.

Comprehensive documentation is provided with numerous illustrations to simplify installation procedures. All documentation fits neatly into existing 3-ring binders provided with the Personal Computer.

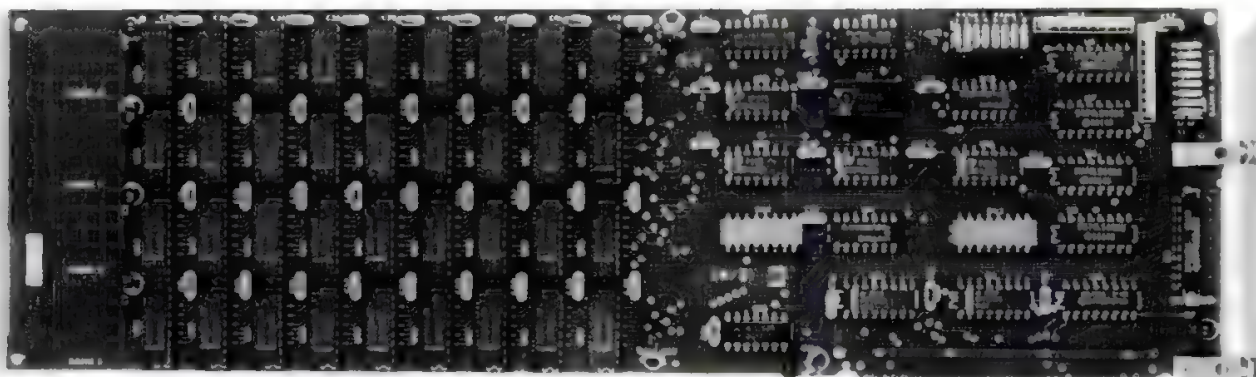
Each PDI464 is "burnt-in" at elevated temperatures and fully tested. Packaging material provides protection from static and mechanical shock during shipment to further ensure reliability. The PDI464 is covered by a one year limited warranty.

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PDI256

256KB Expansion Memory for your IBM Personal Computer.



- ☐ Configured as 4 banks of 64K bytes each
- ☐ Each 64K bank is individually addressable and locatable on 64K byte boundaries
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- ☐ Field expandable up to 256K bytes
- ☐ Guaranteed for 1 full year, same-day service
- ☐ Nickel-plated bracket and card guide included

The PDI 256 provides up to 256KB of user memory with parity on a single expansion board for the IBM Personal Computer. Memory is organized as 4-64KB memory banks, each bank can be set to any 64K boundary within the 1 MB address space. Individual memory banks may also be deselected. All address mappings are made by DIP switch settings for easy configuration. All RAM chips are socketed to allow for easy memory add-on or replacement. Memory refresh for PDI series memory boards coincides with the planar board's refresh. No wait-states are required for expansion memory accesses. The PDI 256 is also available in 64, 128 and 192KB versions which are easily upgraded in 64K steps to a maximum capacity of 256KB.

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Every technology, profession, and discipline has its own language, but the age of computers has spawned phrases that no one comprehends.

Brave New Words

The manual typewriter is dead.

Smith-Corona announced in midMay that it had produced the last of them. The darn things were obsolete.

I held a private funeral. I placed my vintage-1950s Underwood next to my 1970s generic manual and looped a couple of spools of typewriter ribbon over and around them. Then I had a beer.

It isn't that I love manual typewriters. What bothers me is their replacement. Not electric typewriters, which probably don't have many months left to live. I'm talking about computers . . . word processors . . . and worst of all, what they're doing to the language.

This is a sad period in linguistic history. We are in the early stages of the most impersonal age of modern living. Techno-drivel is upon us. Silicon Valspeak—high-technology's low-quality jargon—is destroying the English language. And some say it's here to stay.

It won't be long until adolescents ask if

they can "access the car keys, so they can interface with compatible units and talk about PROMS"—not proms, those annual adolescent bacchanals of yore. And the

THE GENERAL
public misses out on
some great prose.

good-looking kids probably won't go out with anybody whose home unit is under 128K RAM.

When it gets that bad, I'll reminisce. I'll tell kids that people used to speak English. I'll tell them about manual typewriters.

Machines You Could Really Boot

When a manual typewriter fouled up,

you just hit it. Usually, a good swat unjammed the keys and everything was fine. A manual didn't stall, unless you ran out of ribbon. And even then, you didn't have to call a technician. Any dummy could replace a ribbon, and there were plenty of ink smudges on shirts to prove it.

Journalism was for hearty types in those days. Some of the old manuals required 40 pounds of pressure to type a letter. When a story was done, you felt a sense of accomplishment. And the manuals never talked back, never told you to keep waiting or to try again.

I've tried to warm up to computers because people keep saying they're such an important part of the future. Obviously, they are. And I must, in the interest of fairness, admit that computers are remarkable beasts. But it would be easier to warm up to a colony of sea slugs.

When I complain to high technology types about the convoluted acronyms, buzzwords, and other nonsense that make

up the language of high technology, they tell me every other esoteric field has its own argot. But no other language is so unintelligible and foreign to ordinary people. Sure, baseball has its RBIs and ERAs, and medicine has its EKGs and resting pulse rates. But we're not forced to learn about these things. Computers, however, are "the wave of the future," and we better learn how to deal with them.

"Way back when computers were as big as warehouses, the designers needed some way to describe what their computers could do," said Mark D. Johnson, a system manager in Hewlett-Packard's Corvallis, Oregon, office. "They decided that the way a computer talks to a printer could be called 'interface.' New technologies evoked new words. They started saying PC because it was a lot simpler than saying personal computer. That's why there are so many acronyms and abbreviations.

"A lot of people in this business work 10-, 12- and 14-hour workdays. They use the language so much, they might get more comfortable with it than the common language," Johnson observed. This may explain why so many computer buffs seem unable to turn it off, or communicate intelligently with regular folks. They live (or at least, work) in another world.

"One of the most unfortunate things about computer language is that it is so impersonal it sometimes becomes silly," said Edwin Newman, NBC newsman and the author of several books on English usage. "At times, perfectly sensible old

it to the work window. But in computer language it is called the 'input-output user access facility.' How that is an improvement over work window I have no idea. One is three syllables long, the other is twelve, which I suppose is why they use it."

Newman has another favorite. "When the names of people who have died are removed from the social security and medicare computer, it's called 'death termination interface.' This is also known as 'removing the names.'"

THE 1/4U2C *interfaces with all WOMBAT (Write-Only Memory-Bank Access Timer) CRT monitors.*

Interface. Surely you've seen and heard the word dozens of times. But can you define it? Probably not. Neither can computer people, which is precisely why they use it.

"It's ludicrous. It means everything and nothing these days," said Hank Dobin, associate director of the freshman English program at Stanford University. "I can't say I'm much bothered by the intrusion of some computer and electronics terminology into the common language... but it's a simple matter of using and abusing words, and a word like 'interface' is abuse. My belief is that originally it meant 'interaction between two components or parts of a machine,' and it's slowly evolved to mean 'interaction between two living things.' When we have so many better verbs, it's silly to use interface."

Stop the Press Releases!

A curious thing about technobabblers is that they assume people know what they're talking about. They also assume that we care. When they send press releases to the media, for instance, they invariably type at the top: "FOR IMMEDIATE RELEASE." And usually, that's precisely what is done with them. They are quickly released into circular files for death termination interface. So the general public misses out on some great prose. For example, here's a portion of a press

release from Seeq Technology of San Jose:

The DM5213 is specified at 350 ns read access times and 10 ms byte write over the full military operating range of -55 degrees C to +125 degrees C. The military temperature range DM5213 is available for prototyping, and a DM5213/B screened to military standard 833, level B, is available for production. Both are organized 2K by eight bits in the Jedec (Joint Electronic Device Engineering Council)-approved, metal-oxide semiconductor (MOS) byte-wide memory configuration. They are available initially in a 24-pin, dual, in-line package (DIP), and will be available in 32-pin chip carrier.

I can't wait to get my DIP chip carrier. Sounds like a great item to have along on picnics.

My battle with computer language began about 3 months ago, when I moved to San Jose and what is known as Silicon Valley, home of some of the world's most advanced technological development. If I had moved to Germany, I would have tried to learn German. Were it Paris, I'd have tried to learn French. In Silicon Valley, I felt I should try to learn Valspeak, even though it sounded so foreign.

So I went to places where computer experts hang out. I stalked the halls of the hotels and sat at the bars, eavesdropping on conversations. One day the chatter was about CMOS, NMOS, CMOS-SOS, and other communicable diseases. I saw a guy in a cowboy hat and figured a guy like him could at least speak a regional variant of English. He was even wearing cowboy boots. So I introduced myself. My new acquaintance turned out to be the owner of a firm that generates artwork for printed circuit boards.

"Most of the volume in the electronics industry is on peripherals, not on PCUs," the fellow—who, for lack of a less appropriate moniker, I'll call "Tex"—explained.

"Excuse me," I interrupted. "But I don't know what you're talking about."

"That's OK," Tex said. "A lot of people in this business don't understand it."

Just as I suspected.

"A peripheral is like a translator," he went on. "You can have all sorts of them."

RANGE DM5213 *is available for prototyping, and a DM5213/B screened standard 833, level B, is available for production.*

terms are ignored so that new terms can be used. Let me give you an example. For years there was something called the 'work window.' When you were done with your work, whatever it might be, you took

Say you have an IBM typewriter. You hook up with a peripheral controller board and it does things. But peripherals can get very complicated. I have a massive circuit board that does nothing but talk back to the disk drive all day."

Big deal. I have kids who do the same thing.

Dawn of a New Era

I once met a high-tech guy I liked. He's Ted Bettes, an applications engineer for Silicon Valley Group, Inc. of Santa Clara. He said he doesn't understand the language, which is what I liked best about him.

"You might not get too many to admit it, but a lot of us don't understand the language," Bettes said. "But computers are so popular now, people are picking up on words like 'input.' They don't know what they're talking about, but they're using words like that in a bar to seduce somebody."

EAROM-BASED *integrated office subsystem management, and Multiple-Image Digital Read-And- Forget (DIRAF) circuits, the part will be released 2Q84.*

A whole new dictionary of pick-up lines may be evolving.

This is why I like Mark D. Johnson of Hewlett-Packard. He understands some of the perils of high-tech abuse.

"We've already reached the point at which some people won't believe anything unless they see it on television. To take it one step farther, maybe someday people won't believe anything unless they see it on their computer terminal," Johnson said.

"And why should anybody interface with anybody when a computer can give them the information in nice, neat packages? It may get so nobody can stand to be within a mile of each other. They'll communicate with somebody across the world

by computer. But if the persons (or individuals) were in the same room, they'd feel crowded."

Johnson was one of the people I met while eavesdropping on conversations at a high-tech conference. He was going on about TTLs, bipolar and SOS, which I believe are hamburger extenders. And that's when I got the idea to conduct a Silicon Valspeak contest.

The Great Valspeak Competition

I invited people to make up high-tech press releases. I suggested that they load them with buzzwords and acronyms, and try to make them as unintelligible as possible, just like the real ones. Legitimate press releases would be frowned upon. So would absence of levity. I figured maybe some fluent Valspeakers would realize how impersonal and ludicrous their language can be if they had a chance to make light of it. And a lot of them took advantage of the opportunity. Here's a sample:

The latest advance in Super Extra Integration Scale Technology (SEXIST) was introduced by Space-case Enterprises, LTD., of Gualala, a week ago next Thursday. The NX2321SE45-12A incorporates CMOS-HEXFET, SOS-GaAs Gate Arrays, and Vacuum-Tube Bubble Bath (VTBB) technologies on a 23.15 pin (typical) semi-portable industry standard SEXIST package. Said to be useful in CRT I/O receivers, EAROM-based integrated office subsystem management, and Multiple-Image Digital Read-And-Forget (DIRAF) circuits, the part will be released 2Q84, with prototypes available for sampling 3Q85, samples available for prototyping 4Q86, and pinout available 5Q87.

This was submitted by Cliff Gold, Senior Engineer for the Otkel Corp., a video disc drive company in Campbell, California. Gold provided this footnote: "Thank you for this opportunity to express my frustration at the kind of thing I have had to read for 7 years now."

One contestant sent a code for saying high-tech things that made no sense, but sounded good. His system involves four columns of 14 words each. You simply take one word from each column to form such handy phrases as: "Digital input blanking corrector," or "Coaxial optimiz-

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CIRCLE 150 ON READER SERVICE CARD

ed luminance microprocessor," or "Variable spatial feedback keyboard." In the right bars in Silicon Valley, these lines can result in positive interface. In the wrong bars, they can result in broken face.

Another contestant wrote:

Available in standard 23 pin SIP (Skewed Inline Package) and the new ACC (Amphibious Chip Carrier), the 1/4U2C interfaces with all WOMBAT (Write-Only Memory-Bank Access Timer) CRT monitors. Plans are afoot to qualify the 1/4U2C to MIL-I-883 under section PA2/Q (Plans Afoot to Qualify) and to the radiatio hardness spec of MOOG (Microwave Oven Operators Guild).

The winner of my contest was Gene Fifield, employed by McDonnell Douglas Electronics in Palo Alto. Fifield captured this coveted honor by writing:

Filogy Technology announces 27128 WOM Write Only Memory. CAID

(Computer Architecture Interior Designers) can interface this chip using our R2 (recently released) RNPROM 24128 Randomly Non-Programmable Read Only Memory and transfer 128 kByte from RNPROM to WOM to actualize a U2DT (Universally Useless Data Transfer). Faster than 200 nf (nano-fortnites), the RNPROM can withstand 2x10(6) EVEMP as close as 2x2 (10) Kf +- mH (Kf-Kilo furlongs, mH-milli-Hands) u-proc bus requirements meet ELAGJ-20 (European Institute of Apple-loosa Jockeys) using AHTRI VLSI 10 (American Horsebreeders & Thoroughbred Racing Institute Very Long Stretch Instruments). Filogy Technology announces: Manufacture of these two chips is being transferred to an undisclosed location in South America. However, all employees will be given the opportunity to relocate near the new facility: Please be ready at the Greyhound bus stop in Gilroy at 9 p.m. Monday.

Fifield was selected as winner because

it took me and the other four judges a week to realize his press release made no sense. Apple-loosa jockeys was the first clue. If you plan to enter the Second Annual Silicon Valspeak Contest next spring, I suggest you begin training now by writing and saying things that have no meaning. And remember these words of wisdom from Edwin Newman, "There is a serious danger that as we move into this so-called high-tech era, there will be one group of people that understands the scientific and technological work of our time, and then, the great mass of the rest of us."

I plan to be among "the rest of us." In fact, I composed this story on my manual typewriter, a finely-crafted machine that demands too much dexterity for any techno-jockey to operate.

And it didn't stall once.

/PC

Steve Lopez, a columnist with the San Jose News in California, is in the market for a personal computer but is too confused to buy one.

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With INTELLICOM you will be able to communicate with the various data and timesharing services such as The Source and CompuServe. Additionally, since INTELLICOM supports the protocol used by virtually all remote CP/M systems around the world, all users can immediately begin to take advantage of the wealth of public domain software available on these systems. Current, or potential, users of CompuServe can transmit and receive both binary and ASCII data with full error detection and recovery.

The checksum protocols allow for the verification of data blocks transferred (assuming appropriate support on the host end). This feature will be of great value in those applications where data integrity is paramount. INTELLICOM's documentation includes a detailed description of all protocols used along with machine readable examples of host pseudo code that will greatly ease the task of implementing support for INTELLICOM on any existing in-house mainframe (IBM, Dec, Wang ...).

Actual INTELLICOM menu is illustrated below.

- T - Terminal emulation.
- U - Terminal emulation with data capture.
- V - Toggle local echo (off).
- S - Checksum protocol file transmission.
- R - Checksum protocol file reception.
- A - Ascii file transmission.
- B - Ascii file transmission - PTR/PTP protocol.
- C - Ascii file reception - PTR/PTP protocol.
- D - Toggle local display (on).
- W - CompuServe Executive Terminal
- X - Intel Hex file transmission
- Y - Intel Hex file transmission - PTR/PTP protocol.
- Z - Invoke Disk/File function menu.
- E - Exit program.

INTELLICOM requires PC DOS 1.1, one disk drive and either a modem or direct communication to another computer.

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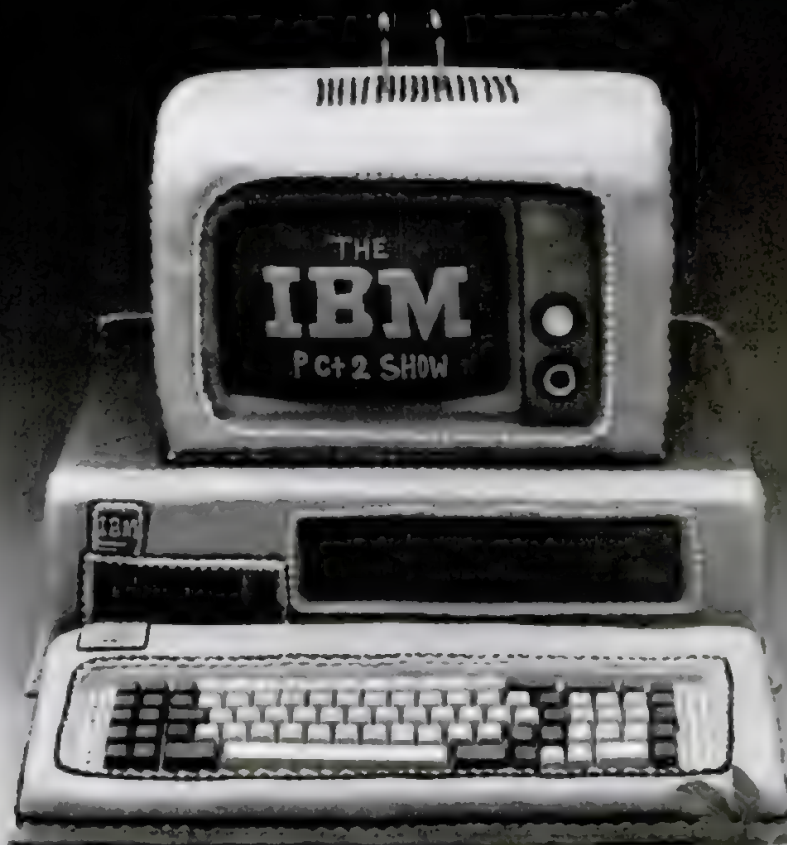
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To paraphrase Nietzsche, "Is CP/M dead?" To paraphrase Shakespeare, "Thereby hangs a tale . . ."

Is CP/M Dead?

Once upon a time, before the Osborne I, when microcomputers were being developed in garages and basements throughout the United States, each machine needed an underlying software system to manage file input and output (known as I/O) as well as messages to and from keyboards, screens, printers, other computers and—in those days—teletype machines, and paper tape punches.

As each machine was readied for market a different, proprietary operating system was developed by the manufacturer. Many of these systems were quite advanced, having been specially designed for one machine, and many included customized versions of their own languages such as BASIC. Among the most successful systems were AppleDOS for the Apple II computers and TRS-DOS for the Radio Shack family of computers.

For the small manufacturer or the computer hobbyist building his own system, developing an operating system was a waste of time. Unless vast amounts of inexpensive programmer time were available and a large market guaranteed, developing a unique operating system was like bringing a 45- $\frac{1}{2}$ rpm record turntable to market; at best it might be a technical achievement, but there certainly wouldn't be any music to play on it.

For the buyer of the microcomputer, the situation was even more dismal. Not only were there very few packages available for these proprietary systems, those

that were available were of questionable quality and relatively expensive.

Enter Dr. Gary Kildall, a consulting programmer with Intel, the chip manufacturer. Kildall wrote a single-user operating system, called Control Program for Microcomputers or CP/M, for a home-brew computer that used Intel's new 8080 8-bit microprocessor chip. The beauty of the system was its compactness; it could easily manage files and small programs on computer systems that provided for only about 16K bytes of random access memory (RAM) and fewer than 150K bytes of disk

TODAY, CP/M IS
being used on several
hundred thousand
microcomputers.

storage. Kildall offered his new system to Intel, which, in the true American tradition, decided that a market for such a system wasn't there and suggested he try his luck elsewhere.

Not a small-scale thinker, Kildall instead opened the doors to Intergalactic Digital Research, later renamed Digital Research International. (After all, what would the neighbors in Pacific Grove

think?) He offered his operating system for sale to all computer manufacturers and made large portions of the system source code available to the general community of programmers. This was the key, since it allowed individuals and software houses to put the new CP/M system on computers even without the cooperation of the manufacturer.

Perhaps even Kildall was surprised when a torrent of computer manufacturers came from the world over to his then tiny California company to buy, for as much as \$50,000, the rights to distribute the 8-bit operating system on a single manufacturer's computer. Today, less than a decade after the first experiments with the single-user computer operating system, CP/M is being used on several hundred thousand microcomputers.

All was not perfect with CP/M and Digital Research, however. Learning a system originally designed for a teletype machine was not easy; the documentation was unreadable, and remained that way from 1977 to 1982. But with auxiliary guides, tutorial tapes and programs, and lots of help from computer program manuals, most users managed, and remain on good terms with CP/M. More critical were Digital Research's growing pains—or absence of growing pains. The company appeared to stand still, unable or unwilling to revise and develop new products. CP/M-86, for example, arrived at least 2 years behind schedule (and opened what is known in

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the industry as a "window of opportunity" for MicroSoft, developer of the disk operating system known as PC-DOS.) The recently released CP/M-80 3.0 (known also as CP/M+) was also 2 years behind schedule, and so far, has not caught on with many users.

About this time (late 1980 or early 1981) IBM decided to make a quick entry into the microcomputer market with a machine based on Intel's 8088 16-bit chip. (It has been said that calling the 8088 a 16-bit chip is an act of charity; the fact remains that the 8088 can address more than ten times the memory of the 8-bit 8085 and Z-80 chips.) At the time IBM was merely putting together components: chips from one company, disk drives from another, a printer from a third. An operating system and basic software utilities and languages were also needed.

IBM Seeks Operating System

The Jolly Blue Giant approached both Digital Research and MicroSoft, the Bellevue, Washington maker of MicroSoft BASIC and a number of other high-quality microcomputer languages, in search of the operating system. For one or several reasons negotiations between Digital Research (which at the time still had fewer than 30 employees) and IBM collapsed. IBM turned to MicroSoft, which in turn called upon Seattle Computer, an S-100 computer manufacturer that had taken an early interest in the 8088/8086 support. Seattle Computer had designed what was then called 86-DOS to be compatible with properly translated CP/M-80 programs.

*IT HAS BEEN
said that calling the
8088 a 16-bit chip is an
act of charity.*

This was crucial, since there were very few programs that could run on the 8088. Shortly after MicroSoft bought the rights to 86-DOS and renamed it MS-DOS, IBM chose MS-DOS to become PC-DOS.

Although marketing, availability, price, personalities, and contractual requirements may have each been factors in

IBM's decision to go with MicroSoft, technical factors were certainly significant. MS-DOS, particularly in its earliest form, was, and is, considerably faster than CP/M because the map of the location of items on the disk was held entirely in memory. Thus there were fewer occasions to access the disk, a comparatively time-consuming operation. In addition, MS-DOS was designed to hold or "buffer" more data on disk in memory. For this reason, program-copying operations under MS-DOS are much faster than under CP/M. Also significant, MS-DOS was, and remains, an easier system for a novice to learn and use. Recent innovations in MS-DOS 2.0, many of which appear to be inspired by Bell Labs UNIX operating system, include tree-structured directories, paths, pipes, and print spooling. Each of these has added considerable power to an already elegant tool. In addition, there is the ability to place a user-friendly "shell" around DOS 2.0. For example, the Wang Professional computer, which also uses MS-DOS 2.0, already has an operating system shell that makes it possible to use nearly every feature of MS-DOS 2.0 from an interactive menu, complete with on-line HELP.

Whatever IBM paid MicroSoft for PC-DOS, the amount could not have been too little. The selection of MS-DOS for PC-DOS turned MicroSoft from a programming language house into a full-fledged operating system design facility. Immediately, hundreds of manufacturers of microcomputers lined up at MicroSoft's door for the right to market the same operating system that was available with the IBM PC.

Although IBM selected the MicroSoft operating system over Digital Research's, rights to market both products—as well as the University of California at San Diego Pascal operating system (UC50-P)—were acquired. The only differences were the name (PC-DOS, which indicated a preference for the MS-DOS system), the release date (PC-DOS was released months before CP/M-86), and the price (CP/M-86 is still being sold by IBM for \$240 compared to \$60 for MS-DOS 2.0). Furthermore, and perhaps a commentary on relations between the two companies, the version of CP/M-86 currently sold by IBM is many months out of date. If anyone still questions the trend, IBM's preferences became even more apparent with the publication of its latest software catalog, *The Guide*. It

does not list a single CP/M product.

Reversal for Digital Research

Such benign neglect resulted in a severe reversal for Digital Research. The creators of the *de facto* standard operating system for 8-bit computers found themselves with less than 10 percent of the market for the 16-bit personal computers and, by some estimates, found the CP/M-86 in use by fewer than 1 percent of IBM PC users.

Despite Digital Research's failure to make headway among the vast majority of

MS-DOS IS considerably faster than CP/M

PC users, the company has been strikingly successful at getting software programmers to write programs for CP/M-86. In fact, most of the significant programs that have been "ported" over from 8-bit CP/M systems are available for both CP/M-86 and PC-DOS. Notable exceptions include, not surprisingly, the MicroSoft family of languages.

Why, considering a less than 5 percent penetration in the marketplace, would CP/M be doing so well among programmers? Partially, because once the system has been moved to the IBM PC, making it function on both operating systems is not a major task. Another reason is that while most of the translation work on established programs was being done, through mid-1982 programmers and software houses were hedging their bets on the ultimate success of each system. Finally, programmers were using CP/M-86 to bring their programs over to the 8086/88 chip. For example, the highly regarded Godbout CompuPro 8085/8088 development system only offers CP/M-86 with its dual processor system.

Rick Rump, creator of MicroShell, a UNIX-like system designed for CP/M-80 systems, recently discussed his partiality toward CP/M-86. "The biggest reason why I am looking more strongly to CP/M-86 than to MS-DOS/PC-DOS has to do with the company that produced the operating system. Digital Research has demonstrat-

ed and promised to support a line of compatible operating systems supported by compatible languages and productivity tools. For a software developer, that is crucial."

Rump described a recently completed crash project in which he was able to use CP/M-68, Digital Research's operating system for the Motorola 68000 microprocessor chip, to move a communication program from a 8-bit 8085-based system, to a 8088-based system and onto the 68000. "The tools and the appearance of the system in all three environments were consistent and the performance impressive," Rump said. "It is clear that MicroSoft has won on the 8088 chip and that Digital Research won by default on the 8080 chips. What isn't clear is who will win across the board."

Although MicroSoft has indicated that MS-DOS 2.0 will eventually be compatible with the Xenix operating system, thus providing a bridge to 68000 computers for MS-DOS-dependent software, that compatibility has yet to be demonstrated. In fact, if MicroSoft and IBM can be faulted at all, it would be on the compatibility issue.

Mike Olfe, a microcomputer software specialist with General Electric's Micro Task Force in Rockville, Maryland, noted that each of MicroSoft's three versions of PC-DOS (1.0, 1.1, and 2.0) has had a new diskette format. "In this aspect of the contest, Digital Research deserves credit for disk compatibility. Under PC-DOS 2.0, WordStar is not working properly; EasyWriter II has problems. Any software that thinks it knows what the disk format looks like will be surprised," Olfe said. Each time such changes are made, software publishers must release new versions of their programs and users must secure updates to their software. "When you make a change like that and you have the kind of market share that PC-DOS has, users have to spend a great deal of time just to catch up to the change. And making the switch to the new system and format is not optional if you want to keep up with a rapidly changing market," said Olfe.

Digital Research is frank in talking about the situation with CP/M-86 on the PC. "Our relationship with IBM has not gone too well to date," explained Kevin Wandryk, a Digital Research product manager. "IBM is offering all three operating systems but only supporting one."

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Taking a philosophical view, Wandryk added, "IBM has historically shown that in the mainframe and the minicomputer worlds they want the whole pie. In large

IBM WILL continue playing various operating system suppliers against one another.

systems business, they have never relied on outside vendors. My personal feeling is that in the long run, the same thing will happen to the operating system suppliers that happened to the makers of hard disks and color monitors when IBM released their XT and color monitor."

There may be something to this theory.

For example, in choosing an operating system of preference for the IBM PC 68000, IBM selected the UCSD p-System over Xenix, MicroSoft's UNIX-like 68000 system. And rumor has it that, for the UNIX operating system being considered for the PC or XT, IBM is looking at places other than MicroSoft. According to this scenario, IBM will continue playing various operating system suppliers against one another until its own proprietary system or systems are ready for release.

The turn of events has altered, perhaps permanently, Digital Research's image as a self-satisfied concern content to ride the wave of original equipment manufacturer (OEM) demand for its operating systems. In fact, the company has now quite effectively cast itself in the "We Try Harder" role made famous by Avis, the number two car rental agency.

Efforts to Bring Back Users

The following are among the major marketing efforts made by Digital Research to bring more users back to CP/M-

86.

- A new version of CP/M-86, costing \$60 was released in March. The new system includes the highly regarded GSX graphics interface and a print spooler. In addition, participating ComputerLands have been giving the CP/M-86 operating system away to buyers of new PCs.

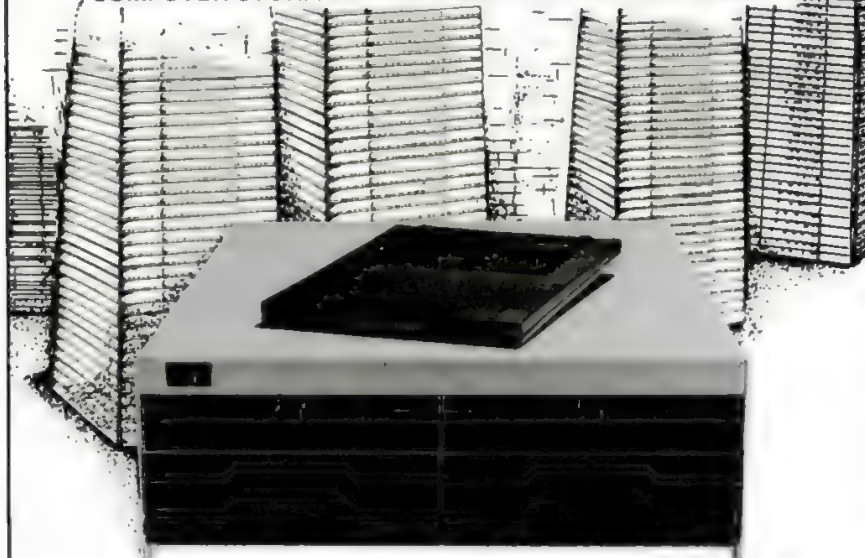
- Concurrent CP/M, released in 1982, offers high-quality single-user multitasking. It allows a single user to manage four tasks at once, with each task residing in memory. For example, a word processing program could be run at one level, a daily appointment calendar/alarm clock could be running at a second, a program could be being compiled at a third level, and a listing of the source code for that program could be printing on a printer through the fourth concurrent task level.

In order to make effective use of Concurrent CP/M, which retails for \$350, rather large amounts of memory are required; 256K bytes is considered a working minimum and 512K bytes is recommended for four concurrent tasks. A hard disk or fixed disk such as the one available with the IBM XT is also highly recommended.

- In June Digital Research announced that most of its 16-bit languages and programming tools including CBASIC, Pascal MT+, PL-1, C, Access Manager, Display Manager, and Level II COBOL would be immediately available under PC-DOS. Heretofore, Digital Research's CP/M-86 languages and other programs, although highly regarded, have not been in heavy demand on the PC because they were not

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available under PC-DOS. Now users of the PC can learn to use and rely on most Digital Research products without having to switch back and forth between operating systems.

- CP/M-68 has been introduced for developmental microcomputer S-100 bus systems such as the CompuPro. This version of Digital Research's CP/M family of

operating systems, unlike those written for the 8080 and 8086 family of Intel computer chips, is written almost entirely in the C language. Thus, CP/M joins UNIX, also written in C, as an operating system written in a language so portable that "putting the system up" on a new microprocessor chips may take days instead of months or years.

Hope for CP/M

Digital Research is particularly hopeful that Concurrent CP/M will woo users back to the CP/M family of computers. "The IBM PC is a perfect environment for Concurrent CP/M. It is the first package that lets you take advantage and see the benefit of a 16-bit system over an 8-bit system. Because of Concurrent CP/M and our new low-priced, enhanced CP/M-86, we predict a 20 percent penetration into the PC operating system market place in the next 2 to 4 months," said Wandryk.

Perhaps the most persuasive long-term argument for CP/M-86 as a software system is its full and easy compatibility with CP/M-80 and MP/M (the company's multiuser system). For example, the DEC Rainbow, which has chosen primarily to support CP/M-86 over MS-DOS, can read disks designed for the DEC Robin, an 8-bit microcomputer. Not only that, by looking at the files, the Rainbow can sense whether a program should invoke the 8-bit or 16-bit processor. And the 8-bit CP/M-80 data files can be read and used by CP/M-86 programs without conversion or modification. But this argument is not really applicable for the IBM-PC.

It is also significant that Digital Research has chosen not to release its languages on the MS-DOS systems for computers other than the IBM PC. This is clearly an effort to convince manufacturers to continue offering and supporting CP/M-86 and Concurrent CP/M on their 16-bit machines. It also represents a marketing strategy for Digital Research.

"Microsoft's MS-DOS is a pretty good product and they have done a pretty good job marketing it. I don't want to cut them down. Having IBM marketing their products helps. But it is a double-edged sword. Companies out there like Digital Equipment Corporation (DEC) and National Cash Register (NCR) or other large system manufacturers can't survive by offering a PC clone. Instead we try and provide for them the total CP/M solution; this gives

them an image or an edge in marketing their computer against the IBM PC," said Wandryk. "Both NCR and DEC," he added, "have decided to offer Concurrent CP/M on their new personal computers." In terms of prestige software, Wandryk claimed that both VisiCorp's VisiOn and

"Even if we do lose this marketplace and it goes totally to MicroSoft, this is only Round Two. There is the 68000, the (Intel) 8286 and 8386, the (National Semiconductor) 16032, and we have a leading edge at the present time in operating system development in each of those areas. We certainly won't be blindsided again," Wandryk concluded.

Back to the original question, "Is CP/M dead?" The answer for the moment and most likely for years to come must be, "No." But for the average IBM PC user and those who are writing software strictly for the PC, the existence of a first cousin to PC-DOS will make little difference and be of little concern. In fact, the release of Digital Research programs to work under PC-DOS can do nothing but reduce the need for CP/M-86 on the IBM PC. For these PC users—barring the immediate need for a multitasking system or the long-term failure of MicroSoft to upgrade MS-DOS to multitasking—CP/M-86 is worse than dead, it is irrelevant. /PC

DIGITAL Research has been strikingly successful at getting software programmers to write programs for CP/M-86.

Lotus 1-2-3 are becoming available under CP/M-86 and Concurrent on a number of 16-bit machines.

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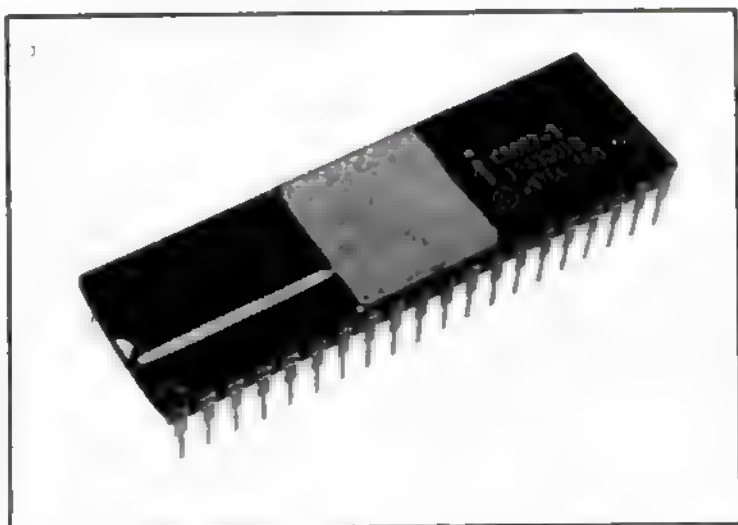
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Spin Physics packs it in with a new diskette that can hold up to 10 million bytes of data.

High Density Diskettes

A floppy diskette capable of holding 10 million bytes of data was shown for the first time at the recent National Computer Conference (NCC) in Anaheim, California. The diskette is a product of Spin Physics (a unit of Eastman Kodak) and goes by the name "Isomax."

The difference between Isomax diskettes and existing diskettes is in the magnetic coating that stores the data. All diskettes are coated with some form of iron oxide (rust), particles of which act like tiny magnets. Data is recorded on the diskette surface by changing the direction of magnetization of the tiny magnetic particles. How much data can be recorded on a diskette depends on the quality of the iron oxide coating on the diskette's surface.

The Isomax medium manages to cram a

lot more data onto the same amount of surface than other media because the particles of the coating are much smaller, more regular in shape and size, and because the surface of the diskette is smoother.

Densities are also increased because Isomax allows what is called "perpendicular magnetization." On most other diskette surfaces, the iron oxide particles are magnetized in the longitudinal direction. It's as if the magnetic particles were lying flat and arranged in concentric circles around the tracks of the disk. Isomax features perpendicular magnetization; that is, the magnetized particles are upright and densities are thereby increased (for the same reason that you can fit more people into a room if they are standing up rather than lying down).

The Isomax coating has already been used by Kodak on a specialized form of videotape. It would be suitable for coating Winchester disks or any other magnetic medium with the same sort of density advantages. Thus, 5¼-inch Winchesters holding 50 million bytes of data or more become conceivable.

Why start with diskettes? "We had to start with something," says Spin Physics' director of marketing, William Kroon. He says that since software packages become increasingly larger, software houses have expressed an urgent need for a high density software-delivery medium. In addition, high density diskettes would be an ideal medium for backup of Winchester disks, a process that is inconvenient and time-consuming.

ing using today's diskettes.

Removable Winchester disks have been proposed for these tasks, but, according to Kroon, they would be more costly than the Isomax alternative. The removable disk would also require a more complicated mechanism and therefore be more subject to failure. (See "Hard Disks Made Easy," PC, Volume 1

Number 10, page 265, for a complete discussion of removable Winchester disks.)

Of course, no diskette drive on the market today can read or write data at the high densities that are possible with the Isomax medium. Spin Physics, naturally enough, minimizes the difficulty of building such a drive, suggesting that

all of the technological elements necessary already exist and have proven feasible. The company almost makes it sound as if Shugart and Tandon and the other drive manufacturers need simply

WOULDN'T
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offered a real advantage,
we'd have seen more
action?

go out back to the warehouse, pull a few components off the shelf, and throw together a new, ultra-high density drive.

Shugart and Tandon aren't quite so cavalier about the Isomax-compatible drive, although they agree that the quality of the recording medium is indeed limiting the densities of current drives.

Tandon's public relations spokesman, Alfred Erickson, pointed out that the Isomax medium isn't as new as all that. It was shown to the drive manufacturers a year ago at a scientific conference; yet we haven't seen drive manufacturers falling over one another to announce new drives. "Wouldn't you expect that if it offered a real advantage, we'd have seen more action?" asks Erickson. Will Tandon produce such a drive? "We're evaluating it, of course," says Erickson, but PC was unable to extract a prediction on when and in what form we'd see real products.

Shugart is also "exploring" the Isomax medium, according to a company spokesman. But Shugart is exploring lots of different options, different media, and different technologies. It is obviously not prepared to make a public commitment to this particular recording medium at this time.

So, if you need a high density diskette today, don't hold your breath. If you're going to need one in the future, you may get one. But whether the disks will use Isomax is not yet clear, so take my advice—don't put all your money into Kodak stocks!
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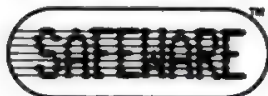
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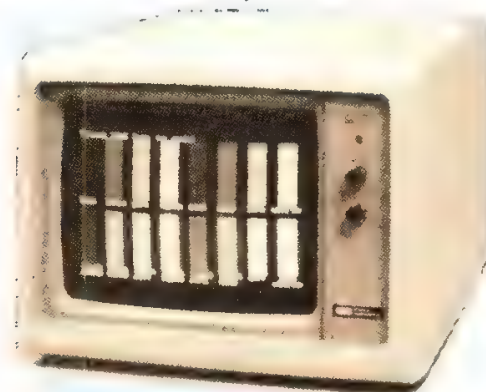
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No, the IBM PC has not acquired sight. But it may play an important role in the computerized link-up that makes inexpensive industrial robots a reality.

Eye Of The Robot: The Optical PC

It may not carry a lunch bucket or punch a time clock, but the IBM PC could still find itself a job on the factory floor. An inexpensive robotic vision system that uses the PC to help identify and react to assembly line components is currently under development. Until recently, robotic vision systems have found limited commercial applications in the U.S. due to constraints imposed by speed, expense, and reliability. The arrival of powerful, relatively cheap microprocessors has spurred research and development work that could result in a proliferation of working robots with television camera eyes. Dozens of universities have research projects under way, while numerous small high-technology companies as well as corporate giants like General Motors, General Electric, IBM, Fairchild, and others are investigating the potential or preparing to enter the market.

The development of fully automated factories has been held back by problems

with machine vision systems. But a variety of systems has now begun to make the transition from the laboratory. Industrial machine vision systems now on the market can inspect turbine blades and computer keyboards; count paper cups; read labels; sort parts stored in bins; and control welding and assembly operations. But the cost of the systems—from \$5,000 for optical character readers to \$100,000 for vision systems on welding and assembly robots—put them beyond the reach of many businesses.

Generalized vision systems that approach human capabilities are not technologically possible at present. In fact, the current doctrine is that a robotic vision system should be designed to fulfill a specific function, rather than an all-purpose role modeled on human vision.

Current thinking also dictates that robot systems should not cost more than 2 years' worth of the wages and benefits of the workers they replace. Even though

robots work 24 hours a day, need no lunch breaks or holidays, take no sick leave, and perform the job to the same level of quality every day, the 2-year figure is generally considered the maximum cost at which robots can be economically justified. The rule of thumb for the robotic vision component of a robot is that it should not cost more than one-tenth of the entire robot system.

A major factor in the decision to develop a vision system based on the IBM PC was that computer's low cost, said Dr. Neil Stewart of the University of Montreal. "We wanted an inexpensive system which we could afford, and which could plausibly be transferred to the factory floor," he said. The ability to do fast floating point arithmetic with an 8087 coprocessor installed in the PC was also a major reason for the choice. The PC-based robotic vision system, like most other vision systems, consists largely of off-the-shelf TV cameras and computers; the software is what really distinguishes the various systems.

PC Splits the Work

The work of handling visual data and controlling the robotic arms is split between the PC and a host computer. The PC vision system normally works in an

MOST VISION systems consist largely of off-the-shelf TV cameras and computers.

infinite loop, in which it digitizes and analyzes the image, recognizes objects, and transmits updates of the scene to the host. A single black-and-white television camera is the "eye" for the PC. (In experiments on stereoscopic vision the system uses a pair of color cameras as eyes.) A pair of "frame grabbers," inserted in the PC slots, samples the image from the camera, forming a digital picture 256 pixels by 320 pixels. However, the vision system's software uses a window only 256 pixels square. Each pixel can have one of 64 values; the image is displayed in various shades of gray.

The PC identifies all the objects in a scene and signals the host that it recognizes fixed objects that, because they are not going to move, do not need to be tracked. The host computer can decide it only wants information about certain mobile objects and designate them as "currently relevant." The PC tracks all objects but only notifies the host of the locations

of currently relevant objects.

According to Dr. Stewart, the shape, direction, and velocity of an object are calculated by the PC; the paths of moving objects are thus extrapolated. While the entire image consists of an area 256 pixels square, only smaller windows—in which an object is expected to appear—will be analyzed at each step in the program loop.

Toward Speech and Computerized Understanding

The obstacles to advances in voice recognition technology are strikingly similar to the problems facing robotic visionaries.

So you talk to your PC—particularly when it does something nasty—but does it really understand? Does it care when you curse, praise, flatter, or plead with it? Not likely. But advances in computerized speech recognition could put systems with limited speech recognition capabilities on the market in the near future. Then perhaps your PC will really know and understand what you are saying to it.

In 2 to 4 years, technology being developed by IBM and Matsushita will result in the introduction of voice-activated typewriters capable of processing continuously spoken speech, according to Alan Bridges of VeXP Research/Systems Ltd. At present, commercially available voice recognition systems are only able to understand individual words or, at best, limited vocabularies of a few hundred words. But work at IBM's T.J. Watson Research Center has succeeded in producing a system that showed 93 percent recognition with a 1,000 word vocabulary. Still, commercially feasible voice recognition systems would require a vocabulary of 2,500 to 5,000 words, Mr. Bridges said. The structure of the Japanese and German languages makes it likely that voice-activated word processing systems will appear first in those countries.

The problems involved in speech recognition are similar to those facing robotic vision systems: distracting backgrounds, in this case noise; input variations, largely the result of individual differences in speech patterns; and the large number of words that might be used. Simply deciding where one word ends and another begins is tremendously difficult for a

machine.

Basic speech recognition systems digitize a voice signal and compare it with a stored reference pattern or vocabulary. If a system is used by many different people, individual variations in pitch, intensity, and speed can make pattern-matching a real problem. The future of practical, inexpensive computerized speech recognition depends heavily on the ability of chip designers to put highly advanced speech recognition algorithms into integrated circuits, which could then join other complex systems on individual silicon chips.

The military is the largest market for speech recognition equipment today and is expected to continue to be so throughout the decade. Uses of speech recognition systems include voice response systems in military aircraft, training systems, and access control for data systems and facilities.

Potential commercial uses include telephone ordering systems for goods and information, and systems for conducting automatic banking and credit transactions by telephone. In industrial settings, speech recognition systems can speed machine-tool control and programming, inspection and quality control, and factory floor data entry. Voice-activated word processors; control systems that respond to voice commands to dim the lights or turn off the microwave oven; voice maps that tell us what landmarks are coming up on our Sunday drive; and a multitude of other serious and frivolous uses are anticipated.

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The whole image is sampled periodically in order to detect new objects that may appear. Information on the location of each currently relevant object is kept in the host memory, giving it a "map" of the environment in which it is working.

Early versions of PC vision software allowed the robot to recognize only a small number of predetermined shapes, such as cubes, cones, and spheres. Newer versions of the software will enable the PC to learn the shapes of objects in its field of vision. This ability gives more flexibility to robotic vision systems. Further, it eliminates the need to write separate software for each object that has to be recognized. It also makes it much easier to recognize parts that may fall onto a conveyor belt in several positions. For example, if a part ends up in four positions, the computer can be taught that each of the four views represents a single object.

Programming for the vision system is done in the IBM macro-assembler language, making program development fairly easy, said Dr. Stewart. Ease in program-

ming is important, as the software will continually be changed as work is done on developing algorithms for vision and analysis, Dr. Stewart said.

A PC-based robot system capable of working on a factory floor is at least a year or two away. Such a system would involve more than the PC-based vision system. It would consist of a variety of hardware and

EASE IN
programming is
important, as the
software will
continually be changed.

software, including ultrasonic and laser rangefinders, and a computer graphics system allowing a wire-frame graphic simulation of the movements of the robot

arms to aid in programming. The goal is for the system to be able to recognize a number of different parts, pick them up with a robot arm, and assemble them automatically. A major question at this point is, "Can the IBM PC handle the calculations quickly enough to function effectively on an assembly line?"

The Ultimate Nightmare

Computer vision is still very crude compared with human vision. "We take our own ability to see for granted, do it effortlessly, and we instinctively feel no reason to believe that the interpretation of [visual] signals may be a very complicated task," said Dr. Tony Kasvand of Canada's National Research Council. But, he said, those who have tried to develop programs for robotic vision systems have learned that the complexity of human vision should be respected. "There is a profound difference between the ability of our own vision and that of mechanized or computer vision systems. Understanding of complex scenes is easy for humans but nearly

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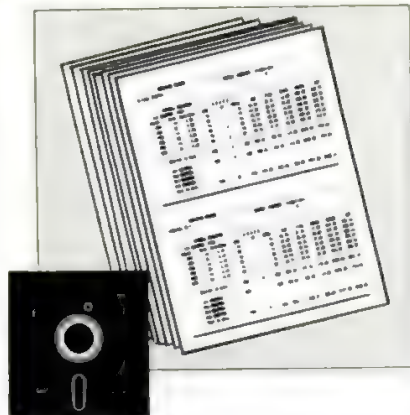
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impossible for computer vision systems."

Many researchers in machine vision say it would be a mistake to attempt to use human vision as a model. A robot's depth perception, for example, is more effectively achieved with sonic or laser rangefinders than by using the slight parallax that results from the separation of two eyes as in humans.

Simple things—a shadow across an object, another piece of equipment partially blocking it, an object facing in a direction that the computer isn't programmed to recognize—can all confuse a robot's vision system. Dr. Kasvand said visual scenes are often extremely complex, and even such relatively simple things as bins or buckets of machine parts present an enormous task for robot vision systems. "The ultimate nightmare of an intelligent robot system designer is likely to be a disorganized repair shop for fixing cars, for example. One has to look for tools to disassemble a mechanism, replace defective pieces, inspect and clean the remaining ones, and then put the mechanism back together again by using whatever tools are handy. The required scene analysis, image understanding and object recognition, the decision strategies and planning, and the required dexterity and control of two manipulators is far beyond our present know-how in computer programming and hardware design."

To overcome the limitations of robotic vision, it is necessary to, in the words of Dr. Kasvand, follow the "triple S rule": simplify, simplify and simplify. The number of objects in a scene and the clutter in the background should be kept to absolute minimum. If more than one object appears, the objects must not touch or overlap, or they will appear as unrecognizable blobs. Lighting is often a decisive

THE "TRIPLE S rule": simplify, simplify and simplify.

factor in the success or failure of vision systems. Lighting the objects from beneath or from one side, to create black-and-white silhouettes, is a commonly used

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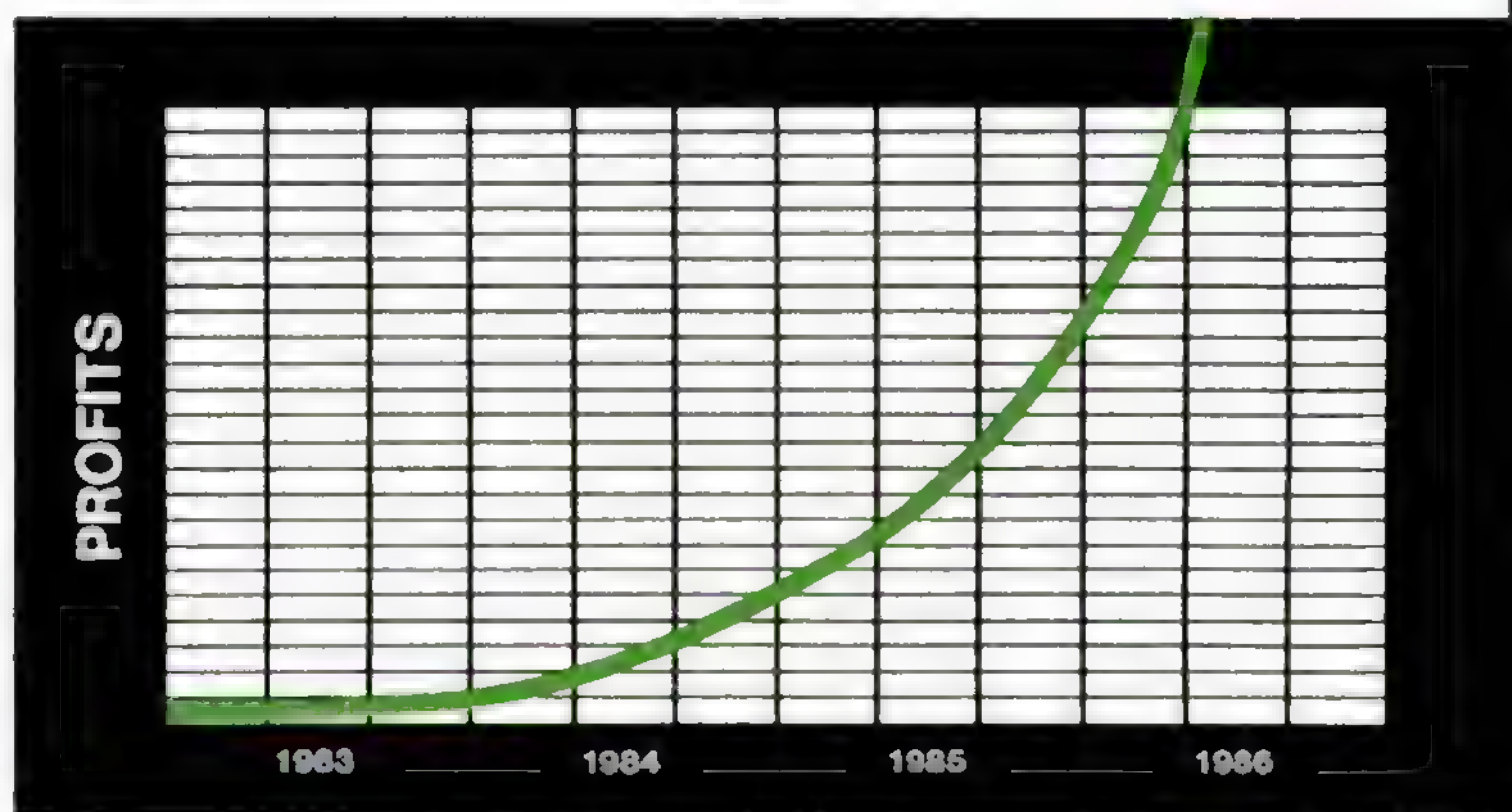
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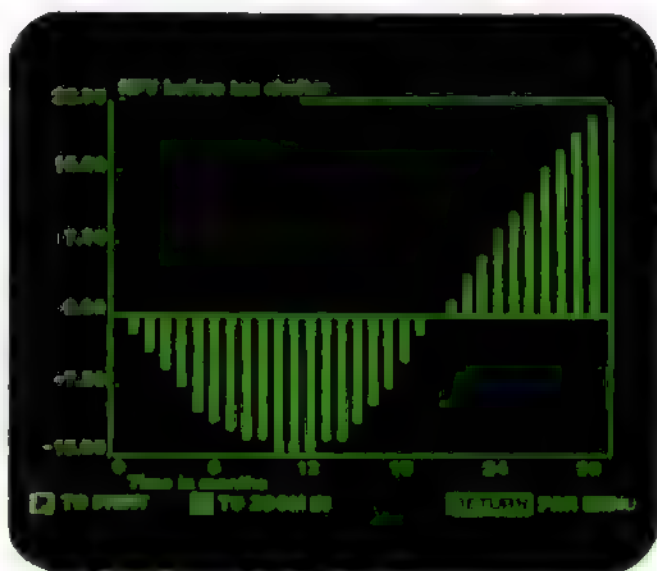
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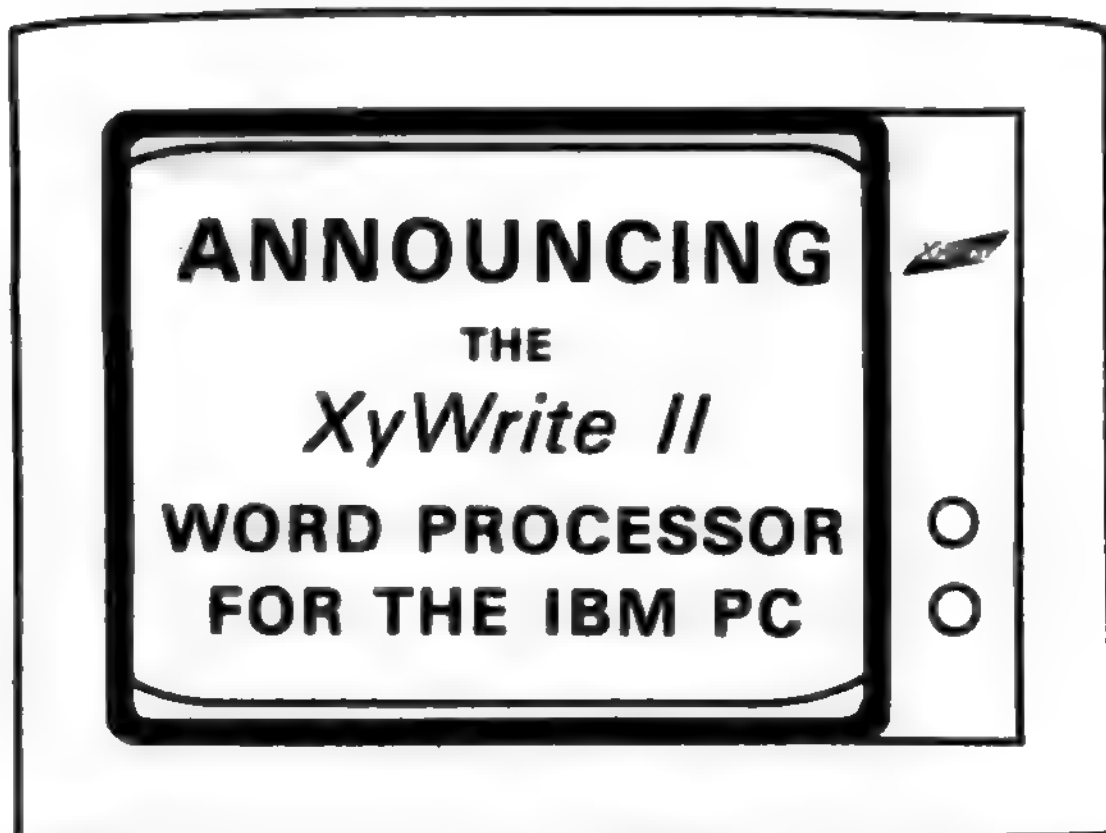
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technique for keeping images simple. Where objects are moving, a flash of light can be used to "stop" them. For complex objects where surface shapes or details

CURRENTLY,
*most robotic vision
systems are used for
inspection and sorting
of parts.*

must be determined, a strip of light may be used. If an object in the scene is flat, the strip of light will be straight. Rounded objects will cause the strip to appear curved, while irregular shapes will cause bends, kinks, and breaks in the light strip.

Anything Goes

In dealing with particular problems in robotic vision, any trick that works is acceptable, Dr. Kasvand said. "Consequently, the possibilities for robotic vision are mainly limited by our imagination and the cost effectiveness of the solution." Image interpretation in an industrial setting can be very simple or very complex. A system that checks labels on bottles will be much simpler than a system that chooses parts from a bin and assembles them. Currently, most robotic vision systems are used for inspection and sorting of parts. New inspection systems are being installed in American factories at a rate of between 400 and 500 per year. Ultimately, from one-third to one-half of the 700,000 factory workers involved in inspection and checking operations could be replaced by robotic vision systems. However, by the end of the decade vision systems will be used primarily to guide robots working in assembly systems. Vision-guided robots are already being used by Lockheed-California to pick parts from storage racks, position them in a riveting machine, and inspect the completed work. Estimates indicate that from one million to three million robots will eventually be in service in American factories; between 500,000 and 800,000 of the units will require robotic vision systems of some sort. /PC

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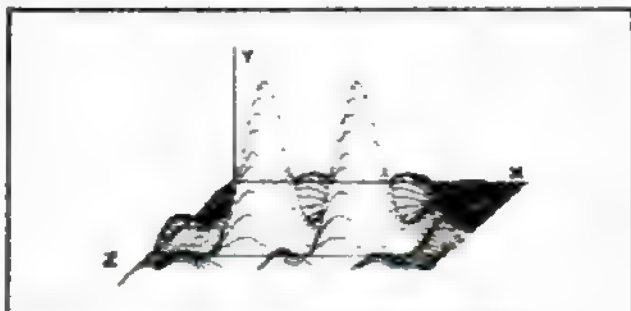
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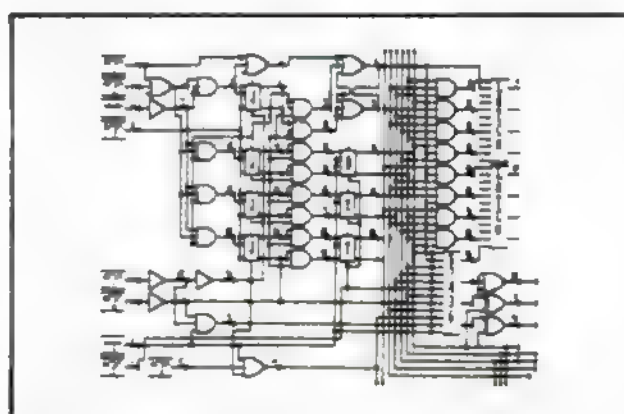
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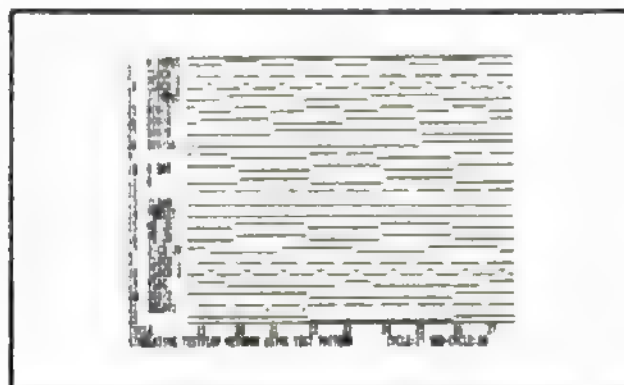
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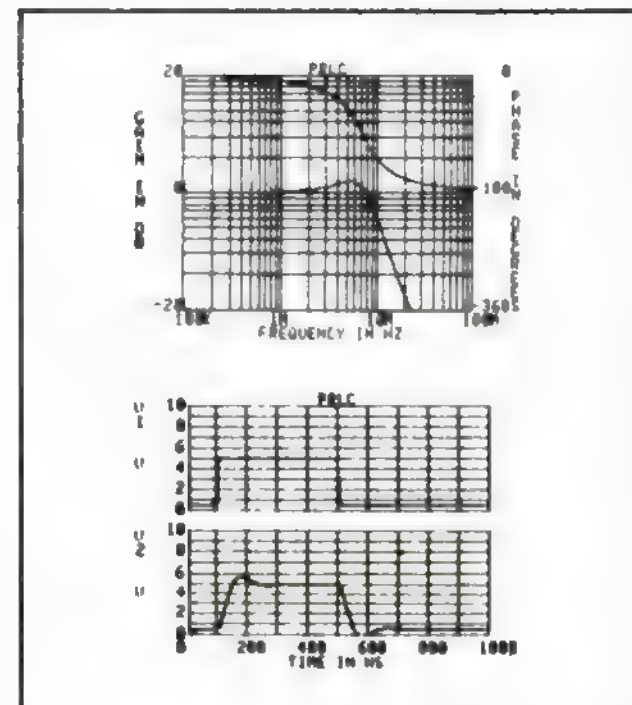
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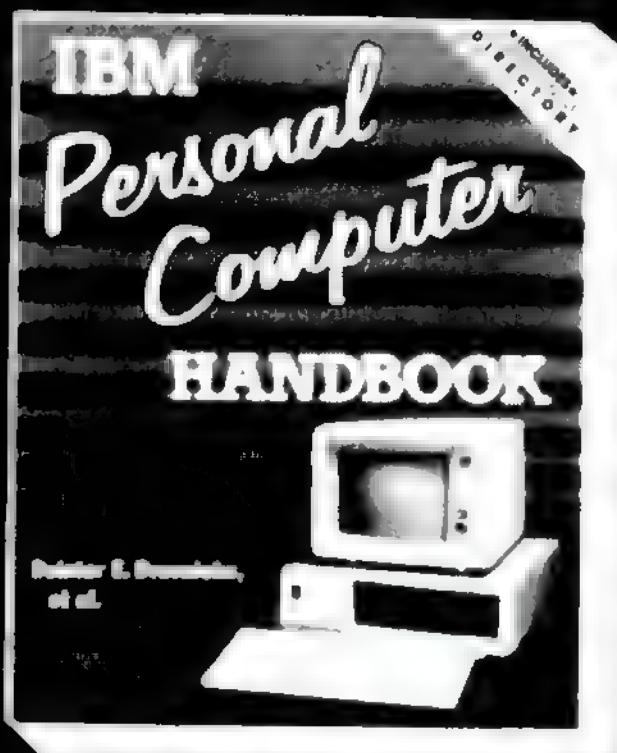
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If you've spent any time on word processors, you have probably discovered that no single program can do everything for everybody. Word processors are collections of trade-offs. When shopping for a word processor, you decide which capabilities you need most and search for the program that comes closest to filling the bill. Some specialized capabilities have been largely ignored by word processor designers, perhaps because they feel the size of the market does not justify the investment. For example, most word processing programs can't support special notation, and those that can are often unable to print these special characters once they are set into text.

One new word processing package called ProofWriter, recently released by Image Processing Systems of Madison, Wisconsin, supports and prints the extended character set and performs underlining and scripting on most printers. The program translates special character codes and can even create new characters on many printers. It also includes mail-merge and spelling-check features.

ProofWriter is actually a set of programs designed to perform specific tasks.

YOU WILL
*never have to patch the
ProofWriter editor with
DEBUG if a new printer
comes along.*

The main modules are an editor, a print formatter, and a spelling checker. The program is enhanced by a printer configuration file and a utility for modifying the

dictionary. The modular design involves the inevitable trade-offs but allows each program to work within its own functional range. You will never have to patch the ProofWriter editor with DEBUG if a new printer comes along.

The ProofWriter manual is well-organized—with labeled dividers, a full index, and a table of contents. Commands are explained clearly and examples are given for the advanced features. A stand-up "reminder" card is included for quick reference to the editing and formatting commands. Ten pages are devoted to starting the program, copying the program disks, and using the tutorial.

ProofWriter can support both single- and double-sided drives, or one drive and one hard disk. A self-copy routine creates a backup, then erases itself. Although the programs are not copy-protected, they will not work unless the hidden file produced by the copy routine is on the program disk. The package has a 90-day warranty and replacement program disks are available for \$15.

The ProofWriter Editor

The editing program operates in two

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stages: main menu and command. After entering the main menu from DOS, you can usually start a new document or modify an existing one (by typing S or M; most ProofWriter commands use similar mnemonic keystrokes). If you view the Directory, a file list appears and remains on the screen as you continue. After an editing session, you can either file results, temporarily leave the editor, return to the com-

***T*HE EDITOR works entirely in memory and is very fast, but requires a minimum of 128K RAM.**

mand level, or simply quit. If you try to quit before filing the edited document, you must verify your intentions. Although you can erase a file, you do not have full access to DOS and therefore cannot rename, copy, or merge.

The editor works entirely in memory and is very fast, but requires a minimum of 128K RAM. With this much memory, there is room for a 32K document. On a 144K system, the editing buffer can handle a 48K document. For larger documents, you are required to edit the first part of the text and file it before reading in more. Function key F2 does this automatically. Total document size is limited to about half the disk size, since the editor retains the original document as a backup copy. If there is not enough room on the disk to write the newly edited file, the program notifies you, giving you a chance to create more space by erasing unwanted files. The print-formatting program is capable of handling files of any size.

The ProofWriter editor offers a wide variety of features that are accessible by a single keystroke. Each letter or function key calls up a different command. To add a new paragraph, you first type A for append; you remain in this mode until you hit the Escape key. To insert new text into a paragraph, press either I or Ins to get into Insert mode. Existing text can be changed by going into Change mode. The top line on the screen reminds you which

mode you are in. All text wraps to the next line automatically.

Other standard features are implemented in a similar fashion: F for find a string, T for transpose two characters, G for global search and replace. X marks the beginning and end in block operations. Zap (with a capital Z) does just that; it erases a block—permanently. The program asks you to verify your intentions before executing since there is no way to recover zapped text.

Text can also be deleted by character (D or Del), word (W), or line (K) at a time. F8 restores the last deleted word or line (this feature allows you to transpose words). The editor does not include an adjustable help level, but by typing H, you can gain access to an on-line help menu that contains all editing commands.

You manipulate the cursor in standard word processor style: by using the arrow keys to move to the top or bottom of the screen, to the left or right a word at a time, and to the beginning or end of a line. PgUp and PgDn move through the document a screen at a time, allowing you to go to the beginning or end of the document.

Under the ProofWriter editor, the function keys serve special purposes. F1 backs up the document by writing a file called Memory on the disk and can be used any number of times during an editing session. Keys F3 to F7 are phrase buffers that can be loaded from the editor with a string of text up to 256 characters long. These strings, inserted into text by a single keystroke, are stored in a file called Setup.

Multiple Key Commands

Since the standard keys are used for standard features, the Alt and Ctrl key sequences are reserved for separate functions. The Alt key gains access to the IBM extended-character set (those characters with ASCII codes greater than 127). To enter one of these special characters, you hold the Alt key down and type in the code for the symbol on the numeric key pad. Twenty-five of the symbols can be assigned to Alt/letter-key sequences, making special character entry even easier. I often use Alt-S and Alt-W to generate a lowercase and uppercase sigma (σ and Σ). Although these keys are set for mathematical notation, they can be customized to accommodate a foreign language or a graphic-symbol set by reassigning the

keys in the configuration program, which rewrites the Setup file. Unfortunately, the editor does not list the current symbol assignment. To overcome this, I simply wrote a document that lists the configuration table, printed it, and hung it on the wall behind my computer.

To embed some of the PC control codes directly into your text, another set of Alt-key sequences is available. Alt-1 through Alt-5 will insert a carriage return, line feed, escape, backspace, or null, respectively, at the cursor position.

The editor uses four sets of Ctrl-key sequences to perform on-screen formatting. Ctrl-U, used to underline text, is canceled by Ctrl-Y. Another set displays emphasized print and can be used in combination with the underline keys. Superscripting is initiated by Ctrl-S and canceled by Ctrl-D. Subscripts use the reverse sequence. Since scripts do not appear on the screen in the same way as they appear on paper, the editor displays them in reverse video. All of these commands embed a hidden control character in the text, and it is sometimes necessary to use the Verify command (V) to ascertain whether a character actually occupies a space that appears blank.

ProofWriter provides another set of Ctrl-key sequences to create "bullet" or indented paragraphs. To start an indented paragraph, move the cursor to the place where the alternate margin should begin and enter Ctrl-C. All subsequent text will be left-justified to this column. When the indented paragraph ends, Ctrl-X cancels the margin. Several Ctrl-C sequences can be used to set up an outline, but they are all canceled by a single Ctrl-X.

A similar feature is especially useful for program writing. The editor allows you to toggle on an auto-indent switch that causes each new line to receive the same number of tabs as the previous line. Entering another tab moves the cursor even farther to the right and moves the backspace one tab to the left. This is useful for structured programs in which the indentation level indicates that a set of commands is part of the same logical group.

To turn on the switch, hit the S key, which sets the display parameters. You can also set the line length and the tabs (up to nine tabs are allowed). Changing the parameters has an immediate effect on the text when you return to command level. While in the Display Parameter menu, you

can also view the Help menu for printer format commands.

Formatting a Document

Since a separate program handles printing, many of the features that affect a printed document are not available on-screen while using the editor. The formatter contains an option to preview the document, but in order to gain access to it, you must leave the editor and enter the formatting program. This takes time, and can be irritating in the final stages of preparing text for printing. This is my most severe criticism of the ProofWriter package, but the trade-off is that the formatting program is very adept at controlling the printer. Nevertheless, it would be helpful to use extra memory to bring both programs on line at the same time, especially when viewing page breaks.

The formatter controls the printer through format codes that the editor embeds in the text. Most of these take the familiar @-sign form, and the actual codes sent to the printer are contained in the Setup file. ProofWriter includes Setup files for over ten different printers. The Config program can either customize an existing Setup file or create a new one.

Format codes are provided for a large number of printer features, including enlarged, condensed, and italicized type. ProofWriter also supports single, double, and triple spacing, as well as full margin control. Pages can be numbered at the top or bottom (center, left, or right), and can be preceded by a prefix. Using the alternating page option, you can add extra margin space on odd-numbered pages to make

UNDER THE
ProofWriter editor, the
function keys serve
special purposes.

room for binding. Numbering can begin with a numeral other than one, but non-numeric schemes such as Roman numerals are not supported. Type can be centered or right-justified. Headers, footers, and footnotes may be included in a document, and six user codes are available for special printer features.



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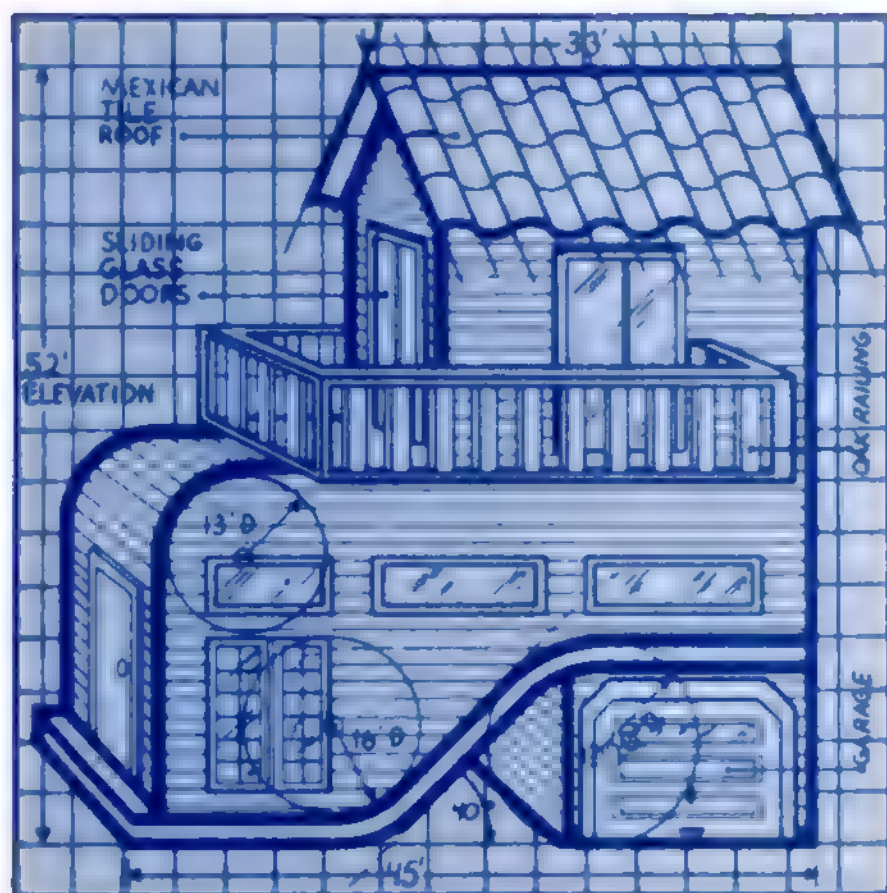
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Special Capabilities

ProofWriter includes a mail-merge feature that uses three codes to control text assembly. The command @MN design-

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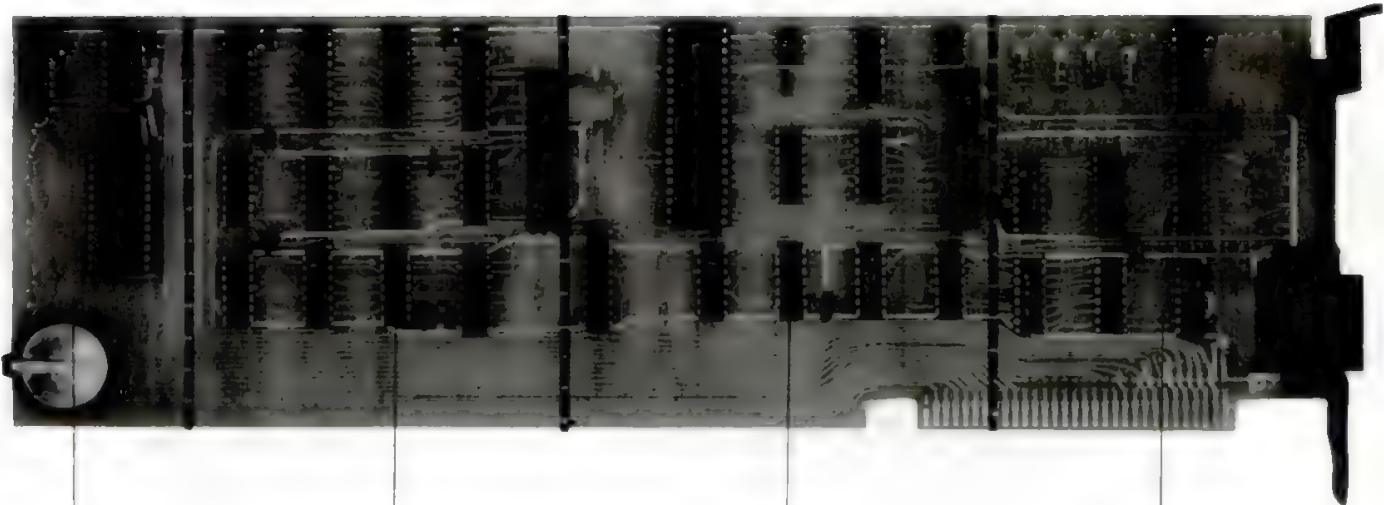
ates the file that contains the inserts for the main document. The "merge in" code, @MI, begins the actual merge, and text is read in from the second file until the command @MF (in the second file) is encountered. The merge-in code can be placed in the main document any number of times. Different sets of inserts can be used to create custom letters. If your address list is maintained by a database management program, however, the program must be able to write standard DOS files with the @MF commands embedded in the proper places in order to use the program directly with ProofWriter. For some applications, it may be easier to use the editor feature, "Read a file from memory," to assemble documents from boiler-plate paragraphs.

Subscripts and Superscripts

The formatter underlines text by sending a carriage return without a line feed, then underscoring the proper characters. A similar sequence is also used to overstrike. For printers without subscript and superscript capabilities, the formatter reads ahead, and when it encounters a line with a superscript in it, it feeds out a half-line space instead of a full-line space. After printing the superscript, it feeds a half line, then prints the text.

The formatter prints a subscript by performing the half-line feed after the text line is printed. Even if your printer does support scripting you may still want to use this formatting option since it is faster and avoids reverse line feeds that can cause the paper to fall out of alignment. All subscripts can be written in one pass without repositioning the paper for each subscript. The methods used for underlining, overstriking, and scripting are chosen

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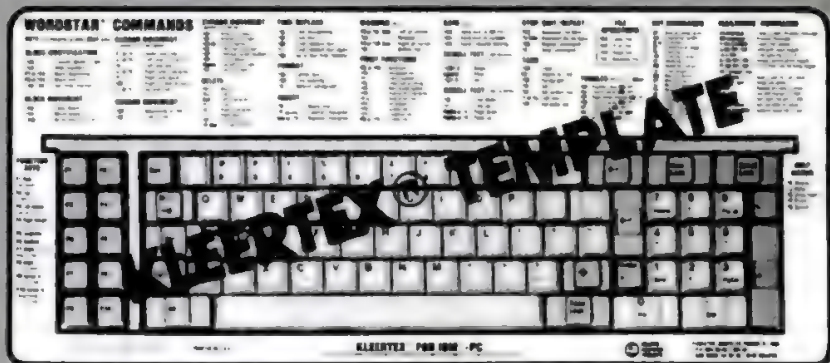
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by default if the Setup file contains no control codes for these features. The system becomes confused, however, if you try to do a subscript on a subscript.

Character Translation

Another file called Altset handles special character translation. In the Config program, after you have assigned a special symbol to an Alt/letter key sequence, you must enter the codes that will be sent to the printer in place of the IBM character numbers. If you are using a printer that also contains these characters, this is a simple one-to-one translation. With other printers, however, it is not so simple. A daisy-wheel printer sometimes requires several codes, using backspaces to overprint several characters, and it may not be capable of printing every special character. If you are using a printer with dot-matrix graphics, you must supply it with a sequence of codes in order to enter the graphics mode, then provide it with another sequence of codes that individually fire the pins on the print head. On most matrix printers, this would require about 10 to 12 codes per character. Any number of special characters may be translated; you are not limited to the 25 assigned to the Alt keys.

Currently, the Config program can automatically generate the codes used to create characters on an Epson printer (with Grafrax) or on the new high-resolution Toshiba printer. The program creates a matrix of the proper size on the screen, and you must move the cursor and "turn on" the dots needed to construct the character. This is not easy, particularly on the Toshiba P-1350, since it constructs each

$$Y_i = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \epsilon_i$$

$$\beta \sim N(\beta, \sigma^2 (X'X)^{-1})$$

$$\Pi(\alpha|X) = \int \Pi(X|\alpha) \Pi(\alpha) dX$$

Figure 1: Two examples of the kind of mathematical equation that can be printed by using ProofWriter.

character from a matrix of dots, 24 rows by 21 columns. With this printer, you must send about 80 codes for each character. Fortunately, the ProofWriter package includes an alternate character set for mathematical notation designed for the Toshi-

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ba and the Epson. Factory support is available for other printers.

Once generated, the code sequences for these "print macros" are permanently stored in the Altset file. There is no limit to the number of codes sent to construct each character, but the file can only hold about 3,300 characters altogether. Since most people writing in special notation use only about 20 to 30 symbols, however, this should not be a problem.

Mathematical Writing

Since mathematical writing is usually full of equations, the formatter uses a command that moves the printer into "equation" mode, where it feeds in half-line increments. You would use this command to write equations similar to those in Figure 1. Each of the expressions appears as several lines on the screen, but each is compacted when printed. You can also use this mode to handle the subscript-on-subscript problem mentioned earlier.

Two additional format commands, designed to keep blocks of text together, are also used in mathematical writing. A con-

ditional page eject (@E) n begins a new page if fewer than n lines remain on the current page. The floating keep (@FK n) keeps n lines together for printing, but fills

PROOFWRITER *includes a spell-check program that features both literal and word- root search modes.*

in the rest of the printed page with text that actually appears after the block.

Although the ProofWriter package includes Setup and Altset files for a variety of printers, some printers are not directly supported. Nevertheless, you may want to produce different setups for different disks; for example, I have one disk configured for pica type and another for elite. To create a custom Setup file, you must run

the Config program, answering a series of questions in order to supply your printer with control codes. One option sends output to the serial port and allows you to choose the baud rate. There are about 50 questions in all, but any code query can be left blank. One interesting set of questions concerns the screen attributes you wish to use; you can decide how the text will appear in the editor. This option allows you to produce full-color word processing on the proper monitor. Using a monochrome monitor run by a color adapter, you can eliminate the "washed out" text that often appears when the color card discovers that it cannot underline and substitutes a color that may be of lesser intensity instead. Or, if you really wanted to go crazy, you could make underlined type blink on and off and make regular type appear in reverse video.

The Spelling Checker

ProofWriter includes a spell-check program that features both literal and word-root search modes. The words indicated as spelling errors are written to a file, accessed by the editor, and highlighted in reverse video. The spell-check program works well but is compromised by a limited dictionary that contains only about 45,000 words. Fortunately, the dictionary can be modified, and running the proof-reader against several long, wordy documents can uncover many new words to include in the word list.

Although it contains many unique features, there are some things that ProofWriter just does not do. For example, you cannot perform block moves on columns of text, and the formatter does not provide automatic handling of proportional spacing. In addition, since there can be only one Setup file on a disk, you must do some juggling if you use two printers. Nevertheless, the only real fault I find with the program is the lack of formatted copy on-screen in the editor. In addition, the package requires 128K, and most people with a system that large probably have quite a bit more memory. If ProofWriter allowed it, they could use this extra memory to have both the editor and the formatter available simultaneously. Still, ProofWriter's limitations are outweighed by its unusual capabilities and reasonable list price. If special-character control is an important word processing feature to you, ProofWriter warrants consideration. /PC

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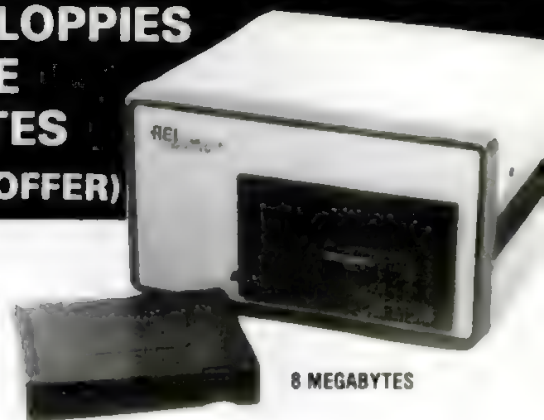
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The F10 key is used as a command key to control the Number Cruncher program functions. Commands to control the program are handled through the effortless use of the bracket character followed by one or more letters. When you press F10, the bracket is automatically printed on the screen for you at the cursor position. Then

Figure 1: This is the Run Menu, where the program's serial number and your name are embedded and displayed. Pressing F9 or the ? key will cause the Help screen explaining the Run Menu's selections to appear.

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RUN MENU

- 1 RUN MODEL
- 2 PRINT MODEL
- 3 PRINT MATH STEPS
- 4 PRINT LAYOUT SHEET
- 5 RETURN TO MAIN MENU
- 6 CHANGE MODEL FORMAT
- 7 REORGANIZE MODEL
- 8 CHANGE PRINT SIZE
- ? FOR INSTRUCTIONS

SERIAL NUMBER 1804

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18006 5000
 1MV UP 2MV DWN 3MV LFT 4MV RGT
 5 6 7 8DONE 9? 0[

RUN MENU SELECTIONS

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- 2 PRINT MODEL - Use this to print out your model on your printer.
- 3 PRINT MATH STEPS - Use this to print out your math steps.
- 4 PRINT LAYOUT SHEET - Use this to print out your model showing the 'item numbers' or 'xx' s.
- 5 RETURN TO MAIN MENU - Use this to go back to Main Menu to 'Save' the model you are working on or to 'Load' a new model from a storage disk.
- 6 CHANGE MODEL FORMAT - Use this to change decimal alignment, size of number items, add new items, delete old ones, etc.
- 7 REORGANIZE MODEL - After you have all your math steps in and you are happy with the results you are getting, use this to speed up my operation.

DEPRESS [O FOR MAIN SELECTIONS OR - [F TO RETURN TO WHERE YOU WERE 1MV UP 2MV DWN 3MV LFT 4MV RGT
 5 6 7 8DONE 9? 0[

all you need to do is type in the command letter or letters you want.

A New Perspective

Pyramid Data is somewhat of a new-comer to the personal computers field, but it is an old-line company when you consider that it was founded in 1975. Until now, the company has concentrated on the mini-computer market. It's obvious that Pyramid Data has taken its experience and expertise from almost a decade of serving customer needs and wrapped it all up in the Number Cruncher package.

Pyramid Data's resources are conveniently only a toll-free call away. In the course of evaluating this program I called its number collect three times and received help immediately. Two questions were contrived by me simply to test the service; they solved them nonetheless. The other problem I called about actually developed only because my mind kept telling me that the process of the Number Cruncher couldn't be as simple as it seemed—it turned out it really is.

Purchasing the System

In a computer store, you've just tried out the Number Cruncher's color tutorial program and decided that this is the program for you. You now have two purchas-

MY MIND
 kept telling me that the
 process of the Number
 Cruncher couldn't be as
 simple as it seemed—it
 turned out it really is.

ing options. The first option is to spend \$39.95 for a version of the complete Number Cruncher program that is limited to produce one-page reports.

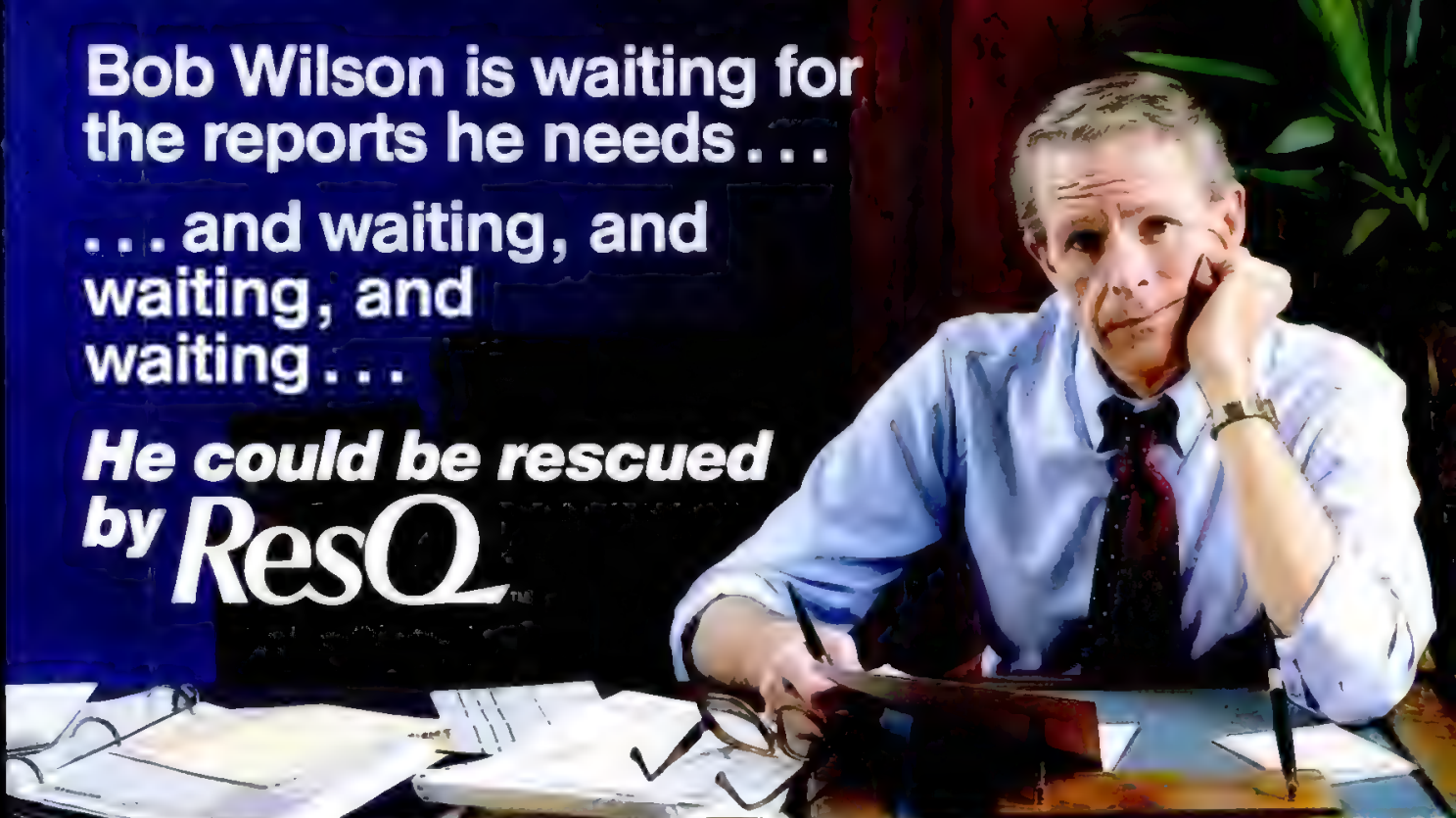
The "unlimited" Number Cruncher program, which handles reports up to 10 pages, costs \$395. You do, however, receive a credit for your original \$39.95 expenditure if you return to your dealer to purchase the full program.

Pyramid Data makes an interesting statement through this unique marketing

**Bob Wilson is waiting for
the reports he needs...**

**... and waiting, and
waiting, and
waiting...**

**He could be rescued
by ResQ**



ResQ is quite simply the easiest-to-use, fastest and most comprehensive information management system ever developed for the IBM Personal Computer. It was designed from the ground up to provide you with the exact information you need... *only* the information you need... in the exact form you need it... now!

Best of all, you don't have to know a thing about computers to take full advantage of ResQ almost immediately!

Like many other Data Base Managers, ResQ organizes, files, locates, controls and interrelates just about any kind of information. It prepares reports and mailing labels, is a general filing and reference system, handles customer records and inventories, tracks sales leads and follow-ups, and does the required calculating for any of these functions automatically. But that's where the similarity to other systems stops!

ResQ is the *only* system that allows you or a secretary to design *your own* forms and reports, create them right on the screen, then have them continuously available at the touch of a key! ResQ offers password protection to keep confidential information confidential, and does it on a number of different levels. ResQ reads, searches and sorts data faster than the fastest competitor we've tested.

ResQ's larger fields hold more information, and field sizes can be easily changed to increase your number of salesmen, products, files or reports. It allows for calculations on up to 8 levels of totals at report time, and interfaces with most popular word processing programs.



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We believe you'll be absolutely thrilled with ResQ and the way it prepares reports, manages information and solves your business problems. We're so certain that we offer ResQ with a 30-day money-back guarantee of satisfaction. You can try ResQ in your own business environment and prove its value for yourself... completely without risk!



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☐ Charge to my

☐ Visa ☐ MasterCard account.

Exp. Date _____

Bank No. _____

(MasterCard only)

Name _____

Firm _____

Address _____

City _____

State _____

Zip _____

Signature _____

Requires IBM PC, with 128 K RAM or IBM XT, 2 disk drives, DOS 1.1 or 2.0. Update policy: Return your diskette at any time and Key Software, Inc. will replace it with the latest version for a \$20.00 fee.

CIRCLE 294 ON READER SERVICE CARD

P-4

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**Victor 9000 in
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approach. It says, first of all, "Here, try the program to see what you think, for a minimum cost. If you don't like it, then you're not out that much money." However, Pyramid is also saying that it has confidence that the Number Cruncher will more than meet your needs and that you will be happy with it.

I ***F*** ***YOU***
don't like it, then you're
not out that much
money.

There's one more aspect to this marketing approach which has to do with copy protection. The Number Cruncher is not copy-protected, at least not as we now know it. It is, however, protected in a rather interesting way against being copied and used by others besides the original purchaser.

When you purchase the full program you don't get it from the store. You pay the store \$395 for it, but the program is then shipped to you from Pyramid's corporate headquarters in Santa Ana, California, via UPS Blue Label.

The program disk you receive has your name embedded on it, along with a serial number. The serial number and your name are displayed quite often in the "Run Menu" of the program. (See Figure 1.) This gives the product a nice personal touch while making the purchaser more accountable for unauthorized sharing and copying.

It's interesting to note that the Number Cruncher will not be available anywhere other than the computer stores now carrying Pyramid products.

Getting Started

Once you bring your Number Cruncher program home, you need to install PC-DOS on the working disks. The package's series of three disks—the Program A and Program B disks and a Storage disk—will run on all versions of PC-DOS.

The routine for installing PC-DOS is a bit complex; it requires that you follow the instructions on the screen exactly as they

are written. Once PC-DOS is installed the Number Cruncher is self-booting.

After the program is loaded in your PC, you first enter the date, which moves you

into the Main Menu (see Figure 2).

The Number Cruncher is totally menu-driven. The menus are all so simple to use that the manual really isn't needed. The

Figure 2: The Number Cruncher's Main Menu, showing options for Getting Started and Normal Operation.

```

PYRAMID'S NUMBER CRUNCHER

MAIN MENU

GETTING STARTED
DEMO  DO THIS FIRST IF YOU HAVE NOT RUN THE NUMBER CRUNCHER
      BEFORE.
TRNG  COMPUTER AIDED TRAINING ON NUMBER CRUNCHER OPERATIONS.
PTST  TESTS YOUR PRINTER.
INST  PRINTS A SHORT SET OF INSTRUCTIONS.
      BOOKPRINTS A COMPLETE SET OF INSTRUCTIONS.

NORMAL OPERATION
NEW   SET UP A NEW REPORT OR MODEL.
RUN   RUN AN EXISTING REPORT OR MODEL ON DRIVE 'A'.
FRMT  PREPARE BLANK (NEW) DISKS FOR USE ON THIS COMPUTER.
COPY  MAKE A BACKUP COPY OF A DRIVE 'A' OR DRIVE 'B' DISK.
SAVE  SAVE THE MODEL ON DRIVE 'A' TO THE STORAGE DISK IN DRIVE 'B'.
LOAD  LOAD A MODEL FROM THE STORAGE DISK IN DRIVE 'B' TO DRIVE 'A'.
DIR   DISPLAY THE NAMES OF MODELS ON THE STORAGE DISK IN DRIVE 'B'.
UTIL  UTILITY ROUTINES - TEST DISKS, ETC.
?     DISPLAY INSTRUCTIONS.

      TYPE YOUR SELECTION. AND DEPRESS RETURN.

```

Figure 3: It is from this New Menu that you create your working models of the Number Cruncher. You can also edit and print model formats from this menu.

```

PYRAMID'S NUMBER CRUNCHER

NEW MENU

1  CREATE A NEW MODEL FORMAT
2  EDIT AN EXISTING MODEL FORMAT
3  PRINT MODEL FORMAT
4  CONVERT MODEL FORMAT TO A RUNNING MODEL
5  RETURN TO MAIN MENU
6  CHANGE PRINT SIZE

?  FOR INSTRUCTIONS

1MV UP 2MV DWN 3MV LFT 4MV RGT 5SH LFT 6SH RGT 7DUPLCT
8DONE   9?   0[

```


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The program forces you to constantly think in terms of your final product. So, say goodbye to the old days of cutting and pasting printouts of those VisiCalc spreadsheets that then had to be reduced

```

PAGE 1 LINE 1 POS 1
.....10.....20.....30.....40.....50.....60.....70.....80
                                BUDGET ANALYSIS PREPARED FOR
                                BIL. ALVERNAZ
                                AS OF XX/XX/XX

                                BIL. ALVERNAZ          DIANA ALVERNAZ

MONTHLY INCOME
WAGES                                XX,XXX.XX          XX,XXX.XX
INTEREST & DIVIDENDS              XX,XXX.XX          XX,XXX.XX
.....90.....100.....110.....120.....130..

                                COMBINED          ANNUAL

                                XX,XXX.XX          XX,XXX.XX
                                XX,XXX.XX          XX,XXX.XX

1MV UP 2MV DWN 3MV LFT 4MV RGT 5SH LFT 6SH RGT 7DUPLCT 8DONE 9? 01

```


MAJOR LEAGUE BASEBALL ON YOUR PERSONAL COMPUTER

Now you can simulate Major League Baseball games on your IBM P.C.

Home Computer Major League Baseball allows you to play Major League Baseball games between any of the teams from the past season (1982), or any of 16 famous Old Timer's Teams.

All batters and pitchers are rated according to the major statistical categories, so their "performance" in the computer games will be similar to the performance for the appropriate season.

Like any good simulated baseball game, Home Computer Major League Baseball contains all of the important baseball strategy options—stolen base, sacrifice bunt, defensive changes, hit and run, infield in, etc. However, Home Computer Major League Baseball contains much, much more—for instance:

- Ability to play against the computer
- Ability to play multiple (e.g. 20, 50 or more) games with the same lineups, with only the final score being printed. These games take less than two minutes each. You can use this option to test various lineup combinations.
- Ability to make trades, create new teams, hold a "free agent draft"
- In addition to printing a box score, the program will update league standings and statistics; you can access the statistics, and print out "League Leaders" for the various statistical categories.

This package is more than just another computer game. It is a complete set of programs which allow you to simulate Major League Baseball in your own home/office. Games, statistics, trades, and more.

- All programs are user-friendly and prompt-driven; you can learn the instructions in a matter of minutes. Games will take 15-35 minutes.
- Music; color supported, not required.

on the copier to fit on an 8½ by 11 sheet. The Number Cruncher is designed to keep you thinking from a report-oriented perspective with a polished, professional end product in mind.

Working with Xs and zeros

A unique aspect of the Number Cruncher is apparent when you begin to set up your model format. (See Figure 5.) There are no row and column numbers to deal with in setting up your number areas. You simply type in your text; then, wherever you want figures, you type in Xs.

It is through typing in Xs that you set up "cells" for the Number Cruncher to work with. These cells are then partially converted to zeros (see Figure 6) for the working model in which you will enter all of your information.

As you set up your model you will type in dollar signs, commas, periods, slashes, or dashes along with the Xs that locate numbers. This allows you the luxury of variable column widths. When it comes time to enter figures you only need to plug in the numbers. The figure "\$4,950.36" would be entered as "495036." You won't need to bother with any characters other than the numbers, so entering your information is quicker and more efficient. The Number Cruncher is also designed to use the numeric keypad, so data entry is calculator-fast.

Typing in your information is truly effortless through the Number Cruncher's

THE CURSOR
movement becomes
lightning fast because of
an artful programming
technique.

word processing feature. To move the cursor horizontally and vertically around the screen you use the function keys, F1 through F4 (F1, up; F2, down; F3, left; F4, right).

The cursor movement becomes lightning fast because of an artful programming technique. If you type in a number and then press one of the four function keys,

Here is a box score of a Home Computer Major League Baseball Game.

DATE: 04-30-1983 TIME: 22:50

1982 Milwaukee Brewers (1)

NAME	AB	R	H	E	R	BB	HR	RBI	SB	MLB	SO
MILITON	5	0	0	0	0	0	0	0	0	0	1
YOUNT	4	0	1	0	0	0	0	0	0	0	1
COOPER	4	0	1	0	0	0	0	1	0	1	0
BLINCH	5	0	0	0	0	0	0	0	0	0	0
ODILITE	2	1	1	0	0	0	0	0	0	2	0
THOMAS	3	0	0	0	0	0	0	0	0	1	2
MIDWELL	3	1	2	1	0	0	0	0	0	1	0
PIEDRE	4	0	1	0	0	0	0	0	0	0	1
BANTNER	3	0	0	0	0	0	0	0	0	1	0
TEAM TOTAL	33	1	6	1	0	0	0	1	0	7	6

NAME IP HITS RUNS ER MLB SO

CALDWELL (L)

6.3	9	3	3	2	1
-----	---	---	---	---	---

MCCLURE

0.3	3	2	2	0	0
-----	---	---	---	---	---

MARS

1.3	2	0	0	0	0
-----	---	---	---	---	---

TEAM TOTAL

8.0	14	5	5	2	1
-----	----	---	---	---	---

1982 St. Louis Cardinals (2)

NAME	AB	R	H	E	R	BB	HR	RBI	SB	MLB	SO
HEAR	5	0	1	0	0	0	0	0	0	0	1
PEASE	5	1	2	1	0	0	0	0	0	0	0
MENDEL	5	1	1	0	0	1	1	1	0	0	0
HERNANDEZ	4	2	2	2	0	0	1	0	0	0	0
SMITH, L	4	1	4	1	0	0	2	0	0	0	0
OSWALD	4	0	2	0	0	0	1	0	0	0	0
GREEN	4	0	1	0	0	0	0	0	0	0	0
PORTER	4	0	1	0	0	0	0	0	0	0	0
SMITH, D	2	0	0	0	0	0	0	0	0	2	0
TEAM TOTAL	37	5	14	4	0	1	5	0	2	1	1

NAME IP HITS RUNS ER MLB SO

PORTER (M)

8.7	6	1	1	7	4
-----	---	---	---	---	---

OUTER

0.3	0	0	0	0	0
-----	---	---	---	---	---

TEAM TOTAL

9.0	6	1	1	7	4
-----	---	---	---	---	---

1982 Brewers

1	2	3	4	5	6	7	8	9	0	HIT	ERR
0	0	0	0	0	0	0	0	1	1	2	1

1982 Cardinals

0	1	1	0	0	0	3	0	0	0	5	14	0
---	---	---	---	---	---	---	---	---	---	---	----	---

Time of game 0 hours 17 minutes 54 seconds

Technical specs: IBM P.C., 64K (160K version now available) minimum, at least one 320K disk drive DOS, BASIC required. Printer supported, not required.

IBM PC is a trademark of IBM Corporation

To order Home Computer Major League Baseball, send a check for \$34.95. Or send for free information to

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Manhasset, NY 11030
(516) 482-6848

Name _____

Address _____

City _____ State _____ Zip _____

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the cursor will then be moved that number of lines or columns on the screen.

If you are in column 5, enter 55, and then press F4, you are zipped to column 60 instantly. The same process is used for going up and down in rows. This feature is handy for entering information as well as editing it.

Another convenient feature of the Number Cruncher allows you to move to any page of your report or document by typing the command [P followed by the page number, which quickly transports you to the page indicated. When you consider that you can have a report of up to 10 pages, being able to move from page to page this way is a welcome facility.

Item Numbers and Math Steps

Before you enter the numbers in your

model, you have a few more steps to complete. These might seem like unnecessary steps to those who are used to working with the current spreadsheets, but remember that the Number Cruncher uses a totally different approach. Actually, these extra steps are design features that make using the program more convenient.

The first of these steps is printing a "Layout Sheet." This is the point where the real differences of the Number Cruncher come into play. From the Run Menu (see Figure 7) you select Option 4, causing a Layout Sheet to be printed.

Now the zeros have been replaced by item numbers (see Figure 7). When you want to plug in a figure at a specific location, you just use the item number. No more row and column number confusion as in spreadsheets with reference cells

such as "AB103." Each item in the Number Cruncher model is numbered.

A 10-page report is limited to 3,400 items. With a hard disk there are no limi-

THE NUMBER Cruncher uses a totally different approach.

tations, except for the 10-page format.

The next step is to work with the model where each value is identified by an item number (see Figure 7). If you want to work out the monthly wages for Bil. Alvernaz, then you work with item number 18. The date in our working model here is item number 6. These same item numbers are then used when you enter your math formulas.

Before you can complete your working model and enter the Math Steps, you need to make a determination as to how each item will be handled. You have four choices: 1, A Data Entry Point; 2, A Constant Number; 3, A Computed Number; 4, A Math Step Point.

A Data Entry Point is any numeric or description field or "cell" that is subject to frequent change. In our working model the date (item number 6) is a Data Entry Point. This would be changed each time the model is run.

A Constant Number is one that will never change. Item number 189 (months in year) is an example of a Constant Number. When you set up the model, you would simply type in this number and proceed to the next point.

A Computed Number is the result of a Math Step. A Math Step Point, obviously, is a location where you actually enter the steps of a math formula that will perform the needed calculations.

Let's look at an example of how easy the Math Steps are. The Math Step for item number 21 (the Combined Wages figure in our working model) is as follows:

ADD WAGES 1 (0018) TO WAGES 2 (0019)

GIVING WAGES 3 (0020)

The Math Step starts out with a function. In this case it is "ADD." It then lists the column number (1) and the item num-

Figure 5: This is what the final model format looks like. The Xs set up the "cells" for the numbers you will enter.

BUDGET ANALYSIS PREPARED FOR MR. & MRS. BIL. ALVERNAZ AS OF 11/11/11				
	BIL. ALVERNAZ	DIANA ALVERNAZ	COMBINED	ANNUAL
MONTHLY INCOME				
WAGES	XX,XXX.XX	XX,XXX.XX	XX,XXX.XX	XX,XXX.XX
INTEREST & DIVIDENDS	XX,XXX.XX	XX,XXX.XX	XX,XXX.XX	XX,XXX.XX
TOTAL MONTHLY INCOME	XX,XXX.XX	XX,XXX.XX	XX,XXX.XX	XX,XXX.XX
LESS TAXES	XX,XXX.XX	XX,XXX.XX	XX,XXX.XX	XX,XXX.XX
NET MONTHLY INCOME	XX,XXX.XX	XX,XXX.XX	XX,XXX.XX	XX,XXX.XX

Figure 6: The Xs that appeared in Figure 5 are converted to zeros in the working model.

BUDGET ANALYSIS PREPARED FOR MR. & MRS. BIL. ALVERNAZ AS OF 0				
	BIL. ALVERNAZ	DIANA ALVERNAZ	COMBINED	ANNUAL
MONTHLY INCOME				
WAGES	.00	.00	.00	.00
INTEREST & DIVIDENDS	.00	.00	.00	.00
TOTAL MONTHLY INCOME	.00	.00	.00	.00
LESS TAXES	.00	.00	.00	.00
NET MONTHLY INCOME	.00	.00	.00	.00

ber (0018). It then gives the same information for the other figure in the addition. The formula is then completed with "GIVING," the name of the item, the column number, and item number. "GIVING" means that the total of the two columns (WAGES 1 and WAGES 2) are just added together.

To enter this Math Step all you had to do was type in "A," which caused the word "ADD" to appear on the screen. You then typed in your first item number—"18." The screen then responded with "WAGES 1 (0018) TO." You typed "19," at which point the screen displayed "WAGES 2 (0019) GIVING." Typing the number "20" then caused the program to quickly display "WAGES 3 (0020)."

The working model in Figure 8 has 43 Math Steps in it. With a hard disk there are no restrictions on the number of Math Steps. However, with a 320K diskette, you are limited to 720 Math Steps.

The Math Steps can be as complex as you wish, matching the capabilities of other programs. You just have to remember that things are done differently with the Number Cruncher.

Running and Using the Model

Having marked all of the item numbers as Data Entry Points, Constant Numbers, Computed Numbers, or Math Step Points, you are now ready to actually use your model.

THE CURSOR starts at the top and works its way to the bottom of the form or report.

From this point on, unless you need to change or modify your model, it will be your working model for entering the information and data you want calculated and processed. The best example of how a model works over and over again for you is an invoice. You set it up just once, the way you want it, then you run it day in and day out in your business.

Figure 8 shows the completed budget

analysis that we've been working on. The numbers were all entered in rapid succession as the program automatically zipped from one item number to the next. All calculations were instantaneously displayed on the screen.

As you enter data, the cursor starts at the top and works its way to the bottom of the form or report—and it does this very quickly. One awkward aspect of the Number Cruncher is that the cursor will stop at item numbers that have already been cal-

Figure 7: The Number Cruncher uses a unique system of "item numbers" to mark the "cells" (spaces reserved for data entry and/or calculations). The zeros on the layout sheet in Figure 6 have been replaced with item numbers.

BUDGET ANALYSIS PREPARED FOR MR. & MRS. DIL. ALVERNAZ AS OF 6				
	DIL. ALVERNAZ	DIANA ALVERNAZ	COMBINED	ANNUAL
MONTHLY INCOME				
WAGES	18	19	20	21
INTEREST & DIVIDENDS	25	26	27	28
<hr/>				
TOTAL MONTHLY INCOME	38	39	40	41
<hr/>				
LESS TAXES	45	46	47	48
<hr/>				
NET MONTHLY INCOME	52	53	54	55
<hr/>				
MONTHLY EXPENSES				
	MONTH - 1	MONTH - 2	MONTH - 3	3-MONTH TOTAL
	*****	*****	*****	*****
MORTGAGE	80	81	82	83
UTILITIES	87	88	89	90
INSURANCE	94	95	96	97
HOUSEHOLD*	101	102	103	104
LOANS	108	109	110	111
CREDIT CARDS	115	116	117	118
AUTO EXPENSES	122	123	124	125
MEDICAL	129	130	131	132
CONTRIBUTIONS	136	137	138	139
<hr/>				
TOTAL MONTHLY EXPENSES	150	151	152	153
<hr/>				
NET MONTHLY INCOME		157	158 PCT.	
MONTHLY EXPENSES		162	163 PCT.	
		<hr/>	<hr/>	
TOTAL AVAILABLE FOR INVESTMENT		171	172 PCT.	
<hr/>				
CURRENT SAVINGS	176	177 PCT.		
HOME VALUE	181			
CURRENT MORTGAGE	184	185 PCT.		
6 MONTHS IN YEAR	189			
9 MONTHS IN QUARTER	192			

* HOUSEHOLD EXPENSES ARE COMPRISED OF FOOD, CLOTHING & ENTERTAINMENT

culated. At these points you need to tap the Enter key to move to the next item number.

An example of how quickly data entry is accomplished can be illustrated by the Mortgage line of the Budget Analysis in Figure 9. Item numbers 80 thru 82 represent the amounts to be paid in "Month-1,"

"Month-2," and "Month-3." The "3-Month Total" (item number 83) and the "Average" (item number 84) are marked for calculations to be performed. As soon as you enter item number 82, the "3-Month Total" and the "Average" figures appear on the screen. Complex mathematical operations in the Math Steps tend to

slow down the calculations, which is true with all spreadsheet programs.

Now that you've entered all of your information, you're ready to print your model. Printing is accessed from the Run Menu (see Figure 1) by pressing 2 to select "Print Model."

One weakness, which is inconsistent with the Number Cruncher's sophisticated program design, shows up when printing the model. There is no way to interrupt the print cycle other than turning off your printer. This can be a real problem if you start to print your model and then realize that you didn't set the printer to be in the compressed mode. Unless you figure out that turning off your printer is the only way to stop it, you will just sit there helplessly looking at the Run Menu while your printer does strange things.

To get out of this you must turn off your printer. Then you will get a "Device Time Out Error" message, at which point you can restart the program and reset your printer for the compressed mode.

Modules for Convenience

For people who like the Number Cruncher's process but don't want to bother with the Math Steps and formulas, Pyramid Data has the answer in the form of program "Modules."

A Module is a program already written for you, which you can load onto your Number Cruncher disk. It's not really a template; it's an actual running model that uses the features of the Number Cruncher in the same way as any models you might

Figure 8: Final printout of budget analysis produced by the Number Cruncher.

BUDGET ANALYSIS PREPARED FOR MR. & MRS. BIL. ALVERNAZ DATE 8/10/83					
	BIL. ALVERNAZ	DIANA ALVERNAZ	COMBINED	ANNUAL	
MONTHLY INCOME					
WAGES	3,650.00	3,650.00	7,300.00	87,600.00	
INTEREST & DIVIDENDS	48.50	48.50	97.00	1,164.00	

TOTAL MONTHLY INCOME	3,698.50	3,698.50	7,397.00	88,764.00	
LESS TAXES	855.00	855.00	1,710.00	20,520.00	
NET MONTHLY INCOME	2,843.50	2,843.50	5,687.00	68,244.00	

MONTHLY EXPENSES					
	MONTH - 1	MONTH - 2	MONTH - 3	3-MONTH TOTAL	AVERAGE
	*****	*****	*****	*****	*****
MORTGAGE	1,450.00	1,450.00	1,450.00	4,350.00	1,450.00
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TOTAL AVAILABLE FOR INVESTMENT		872.12	15.34 PCT.		
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6 MONTHS IN YEAR	12				
6 MONTHS IN QUARTER	3				

* HOUSEHOLD EXPENSES ARE COMPRISED OF FOOD, CLOTHING & ENTERTAINMENT

THE MODULE
saves you the trouble of
having to set everything
up.

have set up under the complete program. The Module just saves you the trouble of having to set everything up.

The Modules are designed to allow you to modify or even change them. However, the Modules are so well thought out that most people will probably be content to use them as they are.

The price of the Modules is reasonable, especially when you consider what the time you would have spent creating their equivalents would be worth. The Loan Amortization Preparer Module costs \$49.95; the Invoice Preparation Module costs \$59.95.

THE NUMBER Cruncher offers small businesses a complete package that is priced right.

Other modules in the works will cost up to \$89.95 and address areas such as Tax Planning, Inventory Control, Stock Portfolio Planning, and Payroll. The Payroll Module will be able to handle data for up to 50 employees. It prints 941s, W2s, a check register, and performs all accounting functions. Checks can be printed in batches or one at a time as needed.

A Complete Package

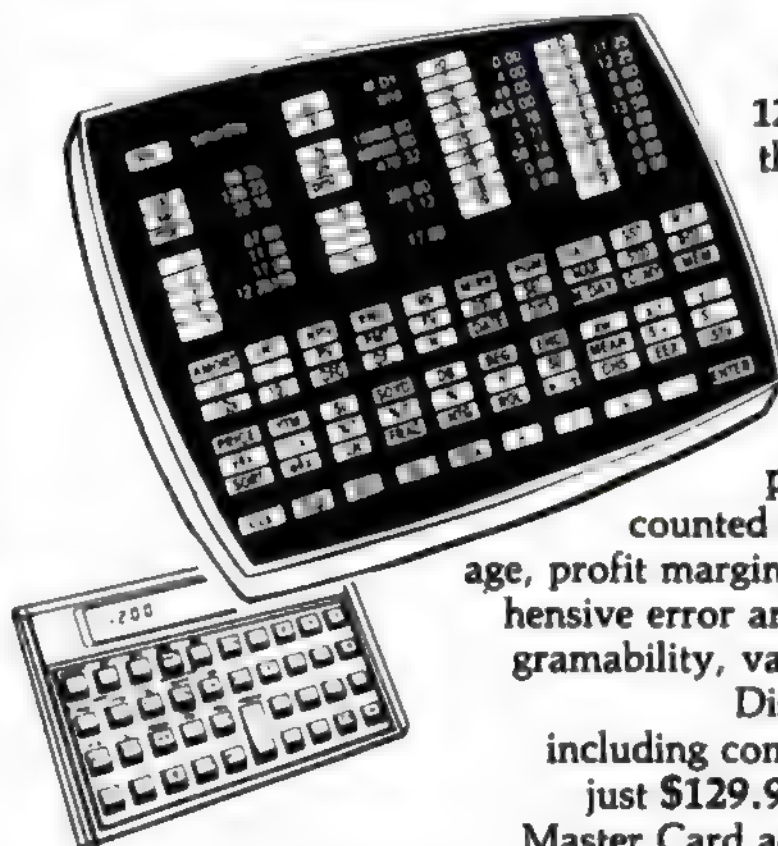
The Number Cruncher, along with its Module options, offers small businesses a complete package that is priced right. Besides being an easy-to-learn program, Pyramid has built in the Module options for those who want the ready-to-run packages. This approach helps keep the basic Number Cruncher program's price down for those who choose not to buy the Modules.

Pyramid Data, Ltd. thought of just about everything, even down to a manual that can be propped up on the desk in front of you while you use the program. The package even includes a cardboard function key overlay that identifies how to use the function keys.

When the showdown is over for the second generation of spreadsheets, the current programs such as 1-2-3, MultiPlan and VisiCalc will still be known as "top guns." But as the sun sets, a program such as the Number Cruncher will be much, much more than just a smoking pistol. It will have had impact, created changes, and started a new trend in program design.

/PC

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It's probably much too nice a day to stay cooped up indoors playing computer video games—which is just as well . . .

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VeriSoft Works
313 W. Rosal
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List Price: \$34.95

Requires: 64K RAM, DOS 1.1, color/graphics board, color or monochrome monitor, joysticks optional.

CIRCLE 699 ON READER SERVICE CARD

Mouskattack

Sierra On-Line, Inc.
Sierra On-Line Bldg.
Coarsegold, CA 93614
(209) 683-6858

List Price: \$34.95

Requires: 48K RAM, color/graphics adapter, monitor.

CIRCLE 698 ON READER SERVICE CARD

There's not an awful lot to Super Novatron, but the game itself is remarkably quick, unusually attractive, and designed with great care. It also talks back to you, a feature that will delight or dismay you, depending on whether you or the computer win most of the rounds.

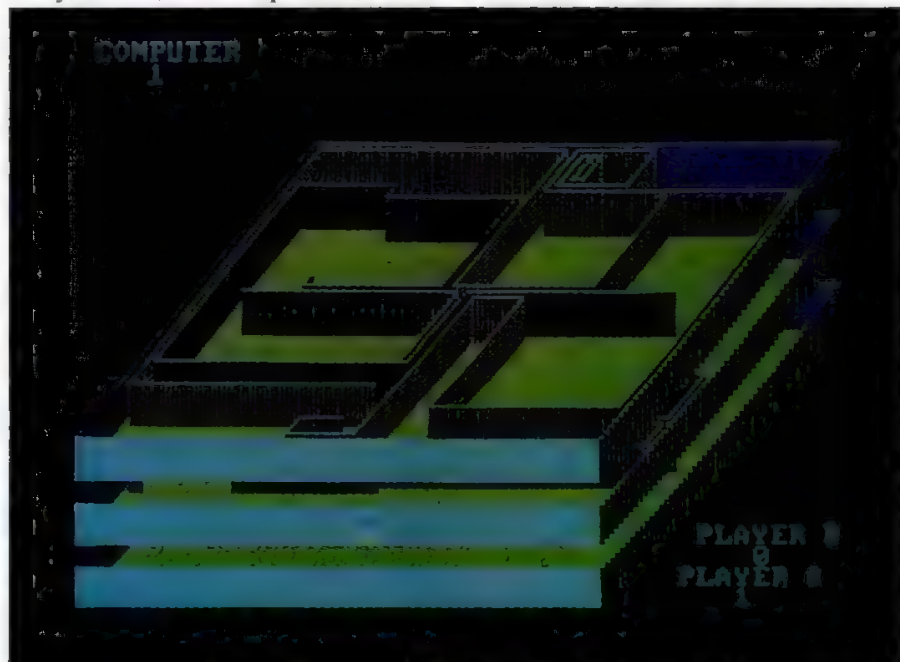
The object is to build walls to trap your opponent (the computer) and force it to crash into a blockade before you do. The computer, of course, has a mind of its own, and sets out to make your efforts futile. Very simple—and very difficult to sustain. The game builds one layer of the board on top of the previous layer in the screen images that catch your eye and your interest.

The game can be played from the keyboard, using predefined commands of the Ins key for left and the Del key for right. Function key F10 speeds up the game, F9 slows it down, and Esc terminates it. All that said, I found it rather difficult to play the game from the keyboard, preferring instead to use a joystick. (The skimpy instruction card for Super Novatron does not even mention that joysticks can be used. You have to boot up the program to discover this feature.)

You are given a choice of joysticks or keyboard, sound or silence, and one of three levels of difficulty. Level 1 was tricky; Level 3, all but impossible, at least

to the neophyte. The program includes an installation program to copy system tracks and COMMAND.COM onto the program disk to allow for an AUTOEXEC batch file. However, Super Novatron was unable to handle the presence of both a monochrome and color/graphics card on my office PC-XT and hung up. The machine had to be instructed manually to switch to the color board. I was unable to crash the program once it was underway.

At the end of each round—and rounds can be very short when you're learning—the program generates a tinny little voice that announces, "The com-put-awr wins round one" or some such line. Be aware



Joshua did better at the Battle of Jericho than you will with Novatron, whose computer-erected walls don't come tumbling down easily.

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CIRCLE 168 ON READER SERVICE CARD

that there is also a product from VeriSoft called *NovaTron Trilogy*, which seems to bear a tangential relation to this offering but is not the same game.

The only real reservation about this game involves its longterm interest. As one of the office staff put it, "It doesn't have much of a plot." But until you get bored, *Super Novatron* is a flashy partner. On the PC Magazine rating scales of one to six (six being highest), *Super Novatron* ratings are average:

FUN:	3.5
CHALLENGE:	3.5
GRAPHICS/SOUND:	4.0
TOTAL:	11.0

This game is a mouse of a different color. *Mouskattack* is a maze game that casts you as "Larry Bain, ace plumber, of Rodent Rooter plumbing service." You must lay pipe while scurrying through all the twists and turns of the maze. At the same time, you have to avoid treacherous roaming rats. You have allies. You can pick up and deposit cats, traps, and other devices to fight off the vermin, but the giant rodents persevere. If you manage to lay all of your pipe without being eaten, you move on to another level of the maze.

Yes, folks, yet another permutation of *PacMan*, even with the variation of laying

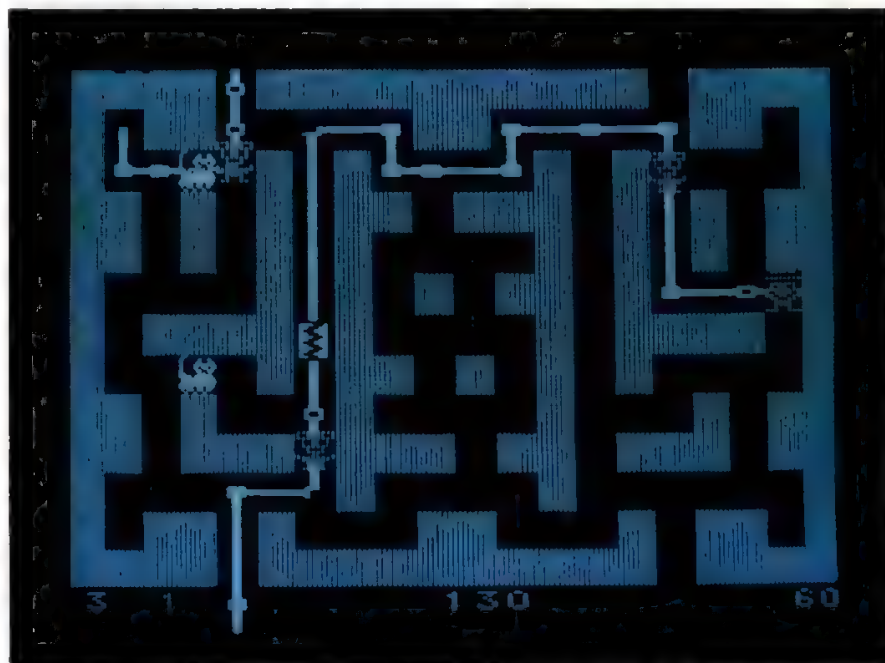
pipe instead of gobbling dots. The game is reasonably well done in terms of graphics and sound, including a nice rendition of Robert Schumann's *The Wild Horseman* but it uses only the keyboard and not a joystick, and the response time is sometimes slow.

But perhaps the most surprising effect is this: Despite the full-color picture of a plumber on the cover of the box, and despite the two-color picture of a maze on the back of the box, on an IBM RGB color monitor this game is displayed in glorious black-and-white! This does not exactly qualify as a sterling example of truth in advertising. According to Sierra On-Line, the game shows its colors on a composite monitor or a television screen hooked up via an RF modulator, but these options were not tested. And nowhere on the packaging is such a warning given.

You are able to define your own keys for movement and for picking up objects. The game can be suspended in midplay, and you can skip over the long bit of Schumann and get right into the chase.

On our rating scale from one to six, *Mouskattack* earns a mousy score:

FUN:	3.5
CHALLENGE:	3.5
GRAPHICS/SOUND:	2.5
TOTAL SCORE:	9.5
	/PC



You are, believe it or not, a plumber laying pipe in *Mouskattack*, besieged by ravenous rats. The display on an RGB monitor, alas, is dull monochrome.

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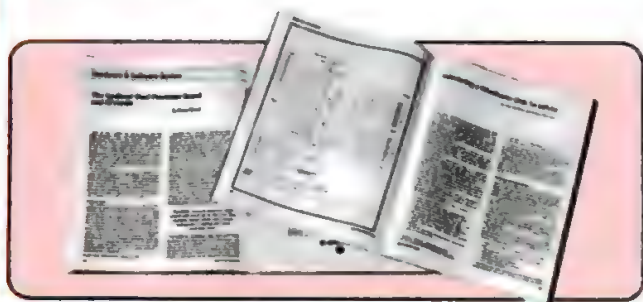
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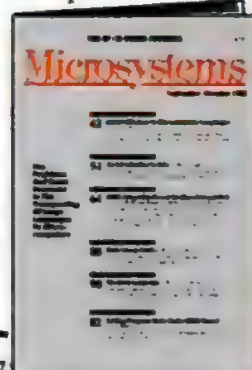
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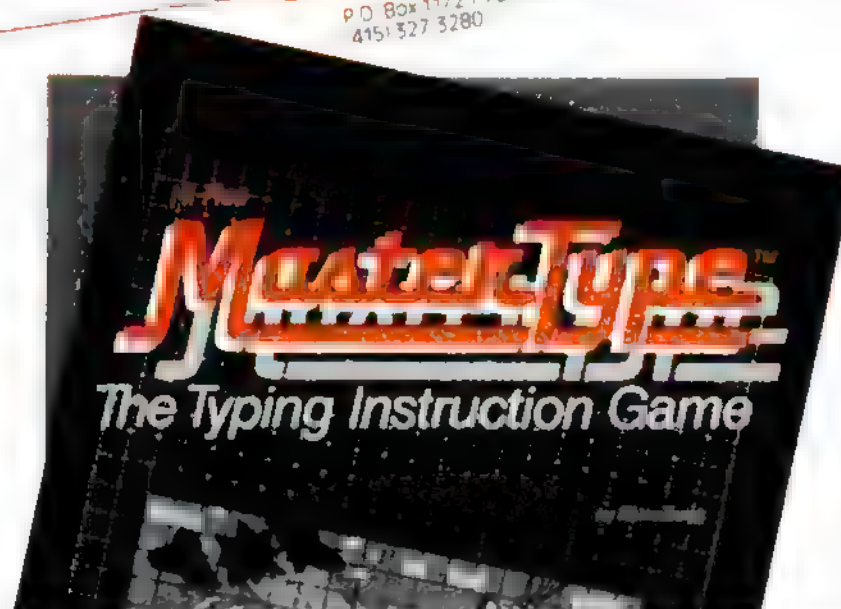
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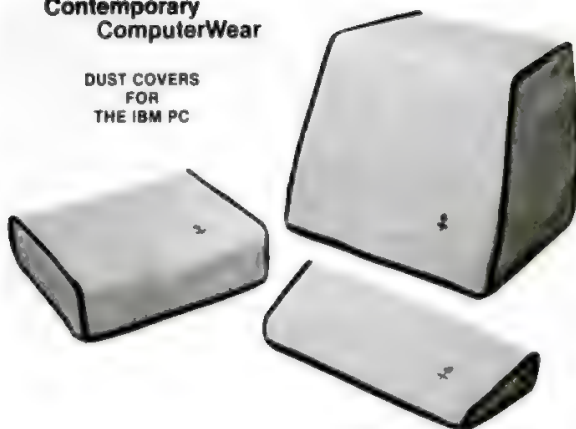
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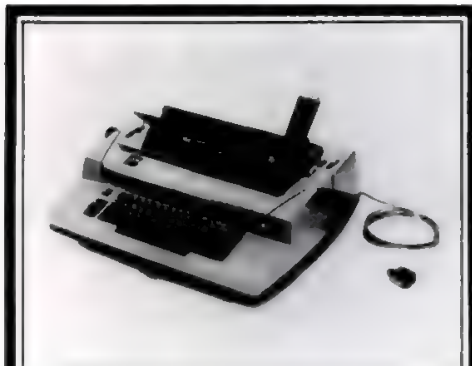
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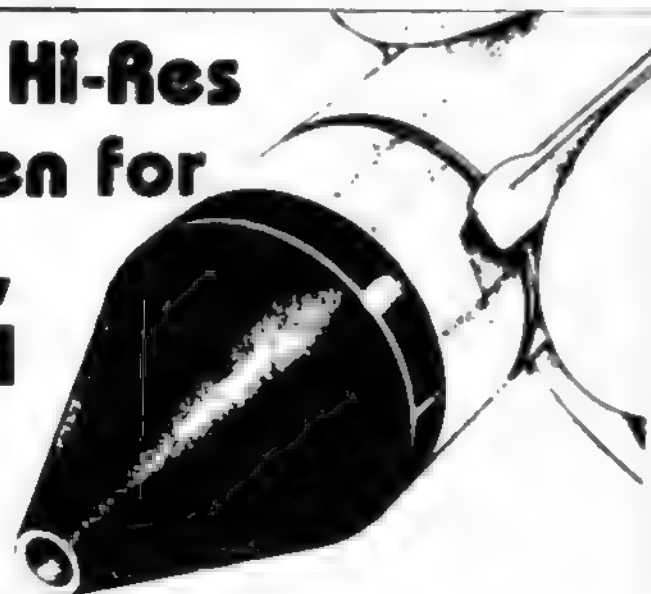
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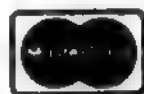
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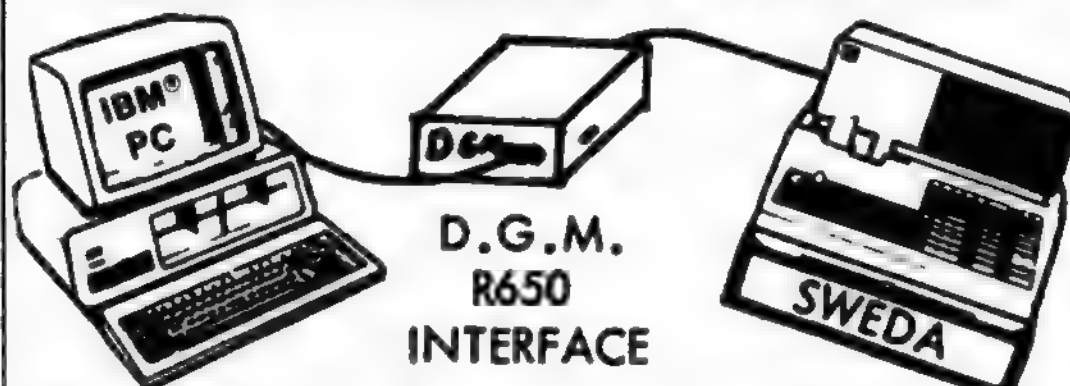
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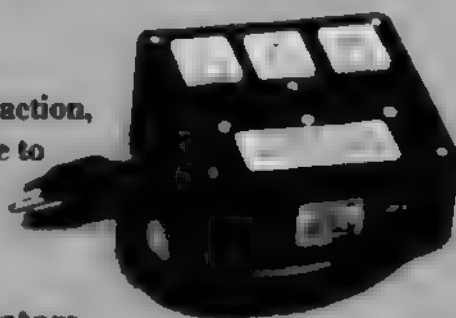
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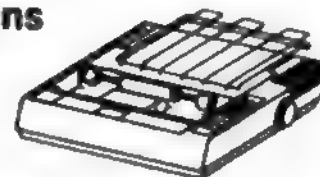
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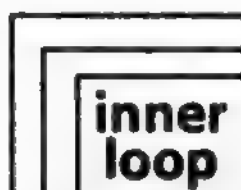
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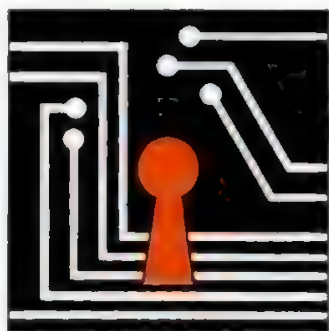
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CIRCLE 211 ON READER SERVICE CARD

PC MAGAZINE 499 AUGUST 1983

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MARK ZACHMANN

Questions about aligning disk drives, connecting a PC and Displaywriter, writing a word processor, and programming a ROM are answered this month by the PC Tutor.

PC Tutor

Aligning Drives

Q: In the article "Avoiding the Worst" (PC, Volume 1 Number 11), the suggestion is made to "...consider checking drive alignment occasionally." I have been unable to find any reference in any manual, including the Hardware Maintenance and Service manual, to checking drive alignment. I would like to know exactly how this is done.

Michael F. Costa
Totowa, New Jersey

A: Drive alignment can be best checked by a qualified service person. If you insist on doing it yourself, then you will need the following equipment: a medium frequency oscilloscope (10 Mhz, preferably with a Z-axis input), an alignment diskette, and the technical manual for your drives.

The alignment diskette is a custom part that you may need to order from the drive's manufacturer. I know that Dysan sells these diskettes; Shugart and Tandon also should know where to obtain them.

The alignment procedure consists of attaching the oscilloscope to a test point



and inserting the alignment diskette. The head is then moved to various parts of the disk and the analog read signal is compared with the desired result. This checks speed and alignment.

If you would like a more inexpensive approach (alignment diskettes cost about \$40 and are uncopiable), there is another test that is nearly as good for normal purposes. To check track seeking, just borrow prewritten disks from your friends and make sure you can DISKCOPY all of them. This is a fairly good way to ensure that your track alignment is adequate.

To check speed, you can borrow an approach from audio turntable makers.

They use a cardboard cutout with lines drawn on it. When the moving cutout is viewed under fluorescent light (which flickers at 60hz in the United States), the lines should appear to stand still. I have seen such cutouts for 8-inch disk drives, and assume similar cutouts are available for the PC's 5-inch drives. Again, this is just a rough test; you should still occasionally have the drive checked out by a competent technician. Under no circumstances should you attempt to align the drives yourself without first purchasing the technical manual for the drives.

One note: the Cromemco Z-series computers often use Tandon drives, and Cromemco includes the drives' technical manual in its literature for dealers. You might wish to check with a Cromemco dealer if you are intent on performing an alignment yourself.

Talking to Displaywriter

Q: I operate an IBM Displaywriter at work and an IBM PC at home. Both work well, but I am sure I could accomplish more if I could make the two machines "talk" to

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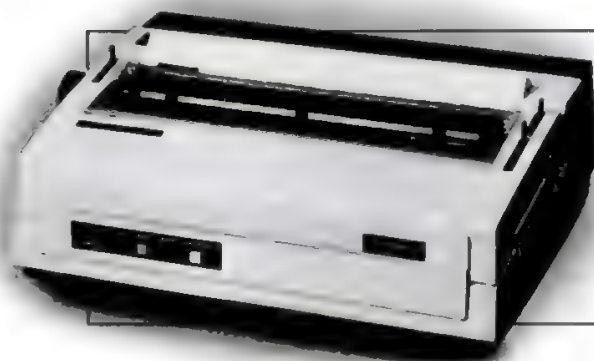
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CIRCLE 471 ON READER SERVICE CARD



each other, or share software. Any suggestions would be greatly appreciated.

Patricia A. Cronk
Madrid, Iowa

A: I am not at all familiar with the IBM Displaywriter, but I can suggest methods appropriate to most small computers.

Usually, when one would like to transport a file between machines, the simplest approach is to tack two serial ports together. If your IBM PC has an asynchronous communications adapter, and the Displaywriter does as well, then you should be able to transfer files back and forth.

This approach usually requires that you have a person attending to each machine. One person uses a PC modem program to send the file while the other person uses a Displaywriter modem program to receive the file, or vice versa. Most modem programs available for the PC will easily accomplish the task, but I am not sure about Displaywriter software.

If you would like to have the PC unattended, then when using PC-DOS 2.0, you just need to type MODE COM1:300 and then CTTY COM1 (assuming you wish to run at 300 baud, even parity). This will put the PC into a remote configuration, so that the Displaywriter can dial up your home computer. This requires a modem with auto answer capability; set the modem to auto answer first.

A far simpler (but more expensive) method would be to use the same operating system and drive size on both computers. The PC can easily support 8-inch drives, such as are used on the Displaywriter, and both systems can run CP/M (and, I think, the p-System). Don't expect programs to transfer correctly, but you should be able to transfer text files. Be warned that most CP/M documentation is notably hazy; also, without the source code to the BIOS routines (and a knowledgeable friend), you may never get the CP/M approach to work.

Another reader (S. McMullan of Saskatoon, Saskatchewan) asked the same question. He seemed to feel that an ASCII to EBCDIC conversion was required, implying that the stock Displaywriter speaks EBCDIC. This would make matters more complicated than could be solved by just connecting serial ports. The only two PC modem programs that can speak EBCDIC (which I know of) are Ascom and Inter-Lync. Both programs have a translate

table capability.

EBCDIC is much like ASCII, but with a different correspondence. For example, character 64 is an EBCDIC space, while 32 is an ASCII space. The book Microprocessor Interfacing Techniques by Rodney Zaks and Austin Lesea (\$YBEX) has an EBCDIC table on page 359.

Cleaning the Buffer

Q: Could you explain how to clear the type ahead buffer in BASIC? I have a program in which I want to be sure there are no characters in the buffer before I issue the prompt. The manual indicates that poking a zero into address 106 will clear the buffer, but that doesn't seem to work.

Ken Hudson
Winnipeg, Manitoba, Canada

TO TRANSPORT
a file between machines,
the simplest approach is
to tack two serial ports
together.

A: As you say, I could not get POKE 106,0 to do anything constructive. According to the manual this is where the program editor works on characters received from the keyboard. However, the PC-DOS 2.0 BASIC manual also states on page I-7 that you can clear the DOS keyboard buffer via this program line.

```
100 DEF SEG = 0 : POKE 1050, (PEEK 1052)
```

Giving ROMs Character

Q: I am writing in response to your column in PC, Volume 1 Number 11. John P. Boyd wrote in asking about a dedicated scientific/engineering word processor for the PC.

You suggested a solution that requires purchasing a new ROM for the PC, and indicated that a programmed ROM could be had for about \$40. Can you suggest a program or person capable of programming my ROM and specifying a new character set I have in mind?

Larry Baca

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| <input type="checkbox"/> use multiple windows | <input type="checkbox"/> draw point, line, circle |
| <input type="checkbox"/> scroll | <input type="checkbox"/> perform text I/O |
| <input type="checkbox"/> implement function keys | <input type="checkbox"/> activate display page |
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A: Something went awry with the answer in that issue (things sometimes come back to haunt me). The correct answer was: a ROM will cost about \$40 exclusive of programming. Some dealers will program the ROM for a small additional cost.

If you would like to program the ROM yourself, then consider buying an EPROM programmer card for the PC. The best such card I know of is the Apparat Prom Blaster, which sells for about \$129 (Appoint, Inc., 4401 S. Tamarac Parkway, Denver, CO 80257). This card seems to be very well made, and its software and documentation are better than most. It will program almost all 24-pin EPROMs, including the Motorola MC68764, which is the chip used on IBM display adapters.

As for creating the character fonts, I have done such in the past. It is a thankless and tiring job, which can do amazing things to your eyesight. One way to get a leg up on the process is by looking at the details of the current font used by IBM. This is easy to do.

To examine IBM's font, just borrow an extra display adapter from a friend and remove the ROM chip. It is the only chip on the card that can be pulled out—make sure you know the correct orientation well enough to put it back safely. The chip is oriented according to a little indentation, either on the upper left corner or in the center of the top side.

Once you pull the chip out, it can be inserted right onto the PC's system board. Just check the placement of the other ROMs to get the orientation right. And, above all, make certain the power is off. The ROM will then be readable just like the rest of the ROMs on the system board, such as the BIOS. You can use DEBUG to examine the ROM's locations and even save them to disk. As I recall, the ROM will reside at addresses F000:4000 through F000:5FFF. The ROM contains four character sets: two color sets and two monochrome sets. The two color sets (8 × 8) are located in the top 4K and the two monochrome sets (9 × 14) are in the lower 4K of the ROM.

Stringing Commas

Q: I have a few questions. First, is there any way in Advanced BASIC to input a string containing commas? Next, how can I change the state of the CapsLock key



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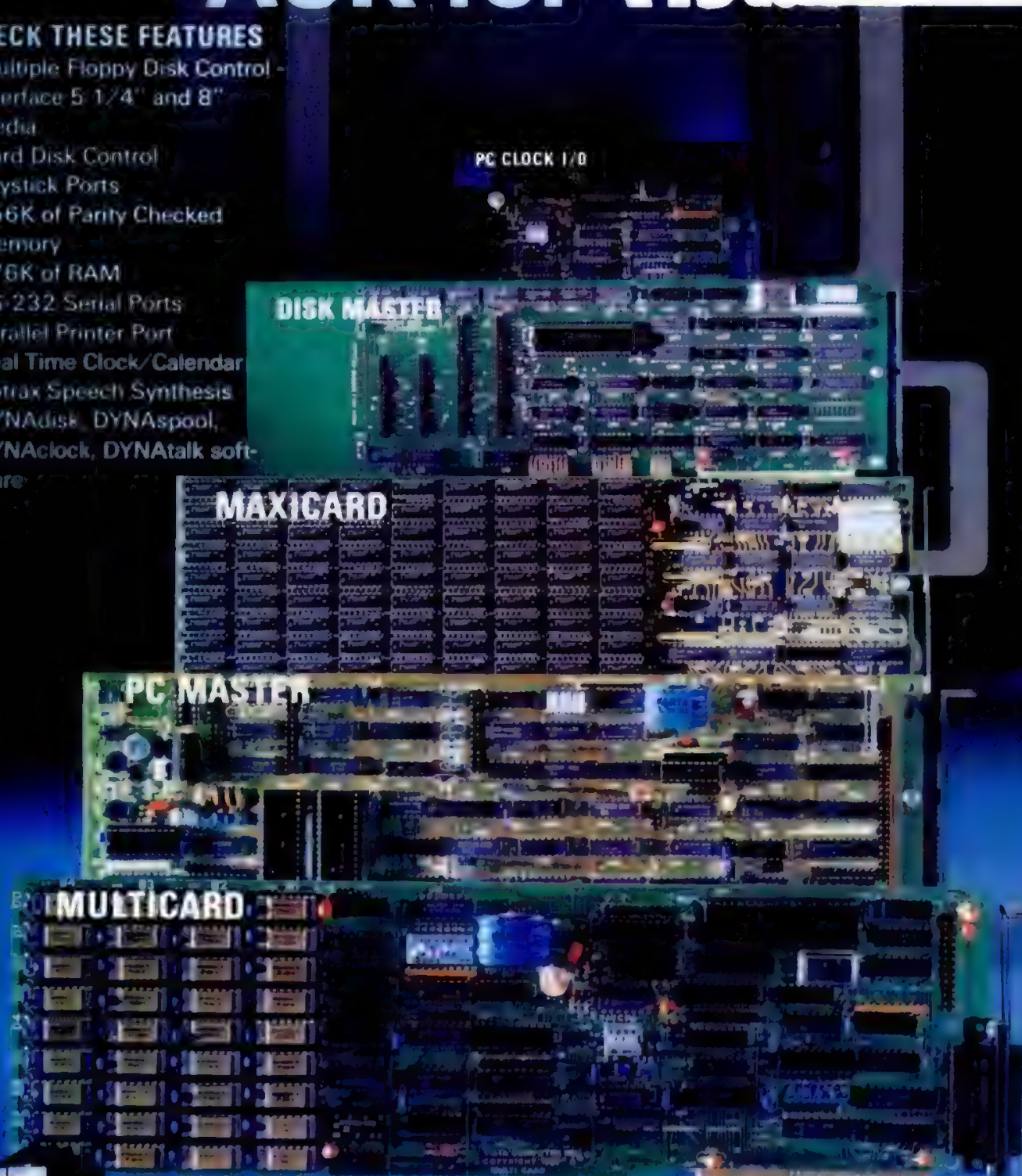
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from within BASIC? Finally, is there an easy way to have a single command copy some files over to my RAMdisk and then execute a BASIC program?

Joe M. Morrison
Earle, Arkansas

A: I'll answer your questions in order.

First, to input a string that contains commas, there are three standard approaches. The simplest approach is to use an INPUT statement with more than one variable. Thus: INPUT A\$,B\$. This will then require that the user enter exactly one comma. Using INPUT like that is good for asking the person for a CITY,STATE.

If you wish to accept input that may or may not include a comma, there are two approaches. The simplest approach is to write a program like the one in Figure 1.

Note that this simple example ignores backspace and escape keys, other than to display them and include them in the string. You can easily change line 120, so that the backspace and escape keys do a character/line delete respectively.

The final way to do string input with possible commas is by doing a machine language PC-DOS call.

In answer to your second question, about altering the CapsLock key value, refer to my earlier column, where the technique was discussed (in PC, Volume 1 Number 11).

For the final question, what you are suggesting can be done using a PC-DOS BATCH command. The simplest way to create a Batch file is by using PC-DOS, as in this example:

```
A>COPY CON: TEST.BAT
COPY BASICA.COM C:
C:
BASICA
Ctrl-Z
A>TEST
```

The important thing here is that the file should have the suffix BAT, which tells PC-DOS that the file contains commands for the operating system. The first five lines create a file named TEST.BAT containing some command lines that will be run as if you had typed them in. If you try running the TEST program (see the sixth line), it will copy BASICA to the C drive, then move to the C drive and run BASICA.

You can easily make more complicated Batch command files, especially with PC-DOS version 2.0, which has far more extensive Batch capabilities. Read the PC-DOS manual for more details concerning Batch programs.

Dangerous Driving

Q: I am confused about whether or not I can drive my IBM monochrome display using the IBM color graphics adapter. The salespeople at the local store say "No!", while on the other hand we have seen an ad for the COLMON adapter box which purports to do what we want. Who is correct? Is it possible to drive the monochrome display via the color adapter with no risk of damaging the hardware?

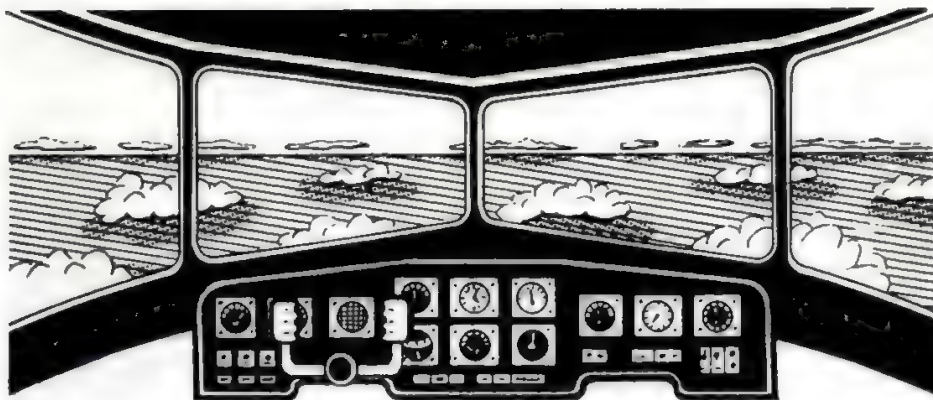
Robert L. Feldman
Ithaca, New York

A: I have received (and answered) this question previously. For the sake of your display, let me briefly reiterate: DO NOT CONNECT THE COLOR ADAPTER TO THE MONOCHROME DISPLAY!

Although software can be written that will allow this to be done with no damage, it is in no way a proper function for an "adapter box"; unless you are very careful to run the software immediately, damage is inevitable. Even with the right software, the end results will be poor. Somehow, it seems better to spend the money on a good black and white display (which can be

Figure 1: BASIC program allowing strings with commas as input.

```
100 I$ = " "
105 REM Now wait for user to type a key
110 A$ = INKEY$ : IF A$ = " " THEN 110
115 REM If carriage return, string is done
120 PRINT A$ : IF A$ = CHR$(13) THEN 140
125 REM Else add new char to string, continue
130 I$ = I$ + A$ : GOTO 110
140 REM Now I$ is the user's input string
```

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had for about \$120) rather than on a \$90 "adaptor box."

Turning On

Q: This may be a silly question, but what is the best way to turn the PC on? We have several PCs, each with external hard disks, color monitors, modems, and printers. On each PC the peripheral equipment is plugged into a surge protector, which is connected to a multi-socket extension that has a circuit breaker.

Wayne Socha
Monrovia, California

A: This is by no means a silly question. In fact, the answer is sometimes debated by supposed authorities. I also have a bias on this topic. In my opinion, the best method for turning on a system is to start with everything turned off, and then to turn things on in order of what they are plugged into. Thus, turn on the multi-socket extension, then the PC, then the peripherals.

Another good question is how to turn things off. You should turn switches off in opposite order: first the peripherals, then the PC. For most of this equipment, it will not really matter what the order is. The exception to the rule is the hard disk. It is usually best to have a stable signal available to any disk controller before the drive is powered up, otherwise transients can ruin information. So make sure that the PC is on before powering up your hard disk, and do not turn off the PC while the hard disk is still running.

With some displays it is best to make sure that the color monitors first have the correct sync signals to generate the right high voltage levels. Therefore, turning the color monitor on after the PC, and off before the PC, makes sense.

If you are really worried about surges, it may make sense to follow the opposite rule when powering the printer on and off. Power it on before the PC and turn it off after the PC. The printer's motor may cause a large surge of power when you turn it on or off. This is particularly noticeable with big line printers, but not so much with present microcomputer printers.

I know that IBM insists that you can safely power up the PC with floppy disks still in the drives. That may be so, but I have had plenty of diskettes ruined in an earlier (though non-IBM) system by leav-

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ing them in when I powered the system down or up. I suggest you remove diskettes before power down, at least.

Which UNIX Is Which?

Q: I read with considerable interest Hanno Hinsch's article on various C language compilers in PC, Volume 1 Number 10. Although the article contained a great deal of information, I am still confused about what differences exist, if any, between running a full C language on PC-DOS as opposed to UNIX.

Also, could you please briefly contrast Microsoft's XENIX with UNIX. Is MS-DOS 2.0 a functional subset of XENIX? Does XENIX contain a full C compiler? Why is XENIX only listed for the 8086—isn't the 8088 fully compatible with the 8086?

One last question. Once a program has been compiled, is that module compatible with all computers utilizing the same CPU, regardless of the operating system that may be in use?

Joe C. Moody, Jr.
Corpus Christi, Texas

A: C language compilers are often called "UNIX C" compatible. That usually just means that the compiler contains all of the features specified in the book *The C Programming Language* by Brian Kernighan and Dennis Ritchie.

The only C compiler I know of that actually contains UNIX-like operating system calls is Whitesmith's C. This is not a particular advantage unless you are very concerned about compatibility of source code. Modifying foreign source code to a new operating system is usually trivial, no matter what the operating systems are.

One C compiler seems like the best thing around for the IBM PC: the Lattice C

never having used it myself (say, is there anyone at Microsoft with a spare copy listening?), but it purports to be externally identical to UNIX, with the addition of some real-time features and some file-locking features.

UNIX is an awful system if you have to work using real-time routines because of its swapping algorithms, which are more or less hard coded. Similarly, UNIX has no file locking, which would be necessary for multi-tasking access to a file, because the designers claimed that no matter how

UNIX IS AN
*awful system if you
have to work using real-
time routines.*

much locking was included it would never be enough. That is theoretically true, but a well designed file locking system will work if the software is also well designed.

Most UNIX work-alikes include a C compiler; I assume that XENIX is no exception. The reason for this consistency is that UNIX is itself written almost entirely in the C language—as is XENIX, no doubt. Since the operating system requires a C compiler, one is usually included with the package. This was particularly important when you remember that UNIX was not supported until last year. Thus, purchasers and OEMs had to make alterations on their own.

XENIX is listed for the 8086, but not the 8088 primarily because, as you pointed out, the 8088 and 8086 are functionally equivalent. Listing both chips would be like listing the Z-80, Z-80A and Z-80B as different chips; they differ only in the maximum clock speed.

As to your final question: Once a program has been compiled, it will run only on the operating system and CPU it was designed for.

The CPU determines the actual form the machine language instructions take. You cannot take compiled software designed for one CPU (say the 8080) and run it on another CPU (like an 8088). None of the machine language instructions will

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EBCDIC IS
*much like ASCII, but
with a different
correspondence.*

compiler. (See "Is Lifeboat King Of The C's?" in PC, Volume 2 Number 12.)

I can not talk about XENIX very much,

make sense to the new CPU. Similarly, a compiled program has to have some way to handle input and output for the console and disk drives. Unless there are security or speed reasons, this I/O is routed through operating system calls. Moving to a new operating system means that the calls no longer have the same meaning—

they may even be meaningless.

I don't know if MS-DOS 2.0 is upwards compatible with XENIX. If so, that would imply that every operating system call (via INT 21hex) exists in XENIX. My guess is that only the newer calls, such as those that use an ASCIIZ representation, are XENIX compatible. Other comments and

information would be appreciated. Certainly, UNIX stores files with LF as a line end delimiter, while MS-DOS uses the usual CR-LF convention.

Writing a Word Processor

Q: I am writing a word processing program in BASIC and have the following questions. How can you print an underlined word on the screen without having to use embedded commands? My program creates text by building an array of strings. Thus, poking the screen or using a color

***H**OW CAN YOU
print an underlined
word on the screen
without having to use
embedded commands?*

statement will only produce temporary underlining. What I need is a way of saving the underlined word in a string if this is possible.

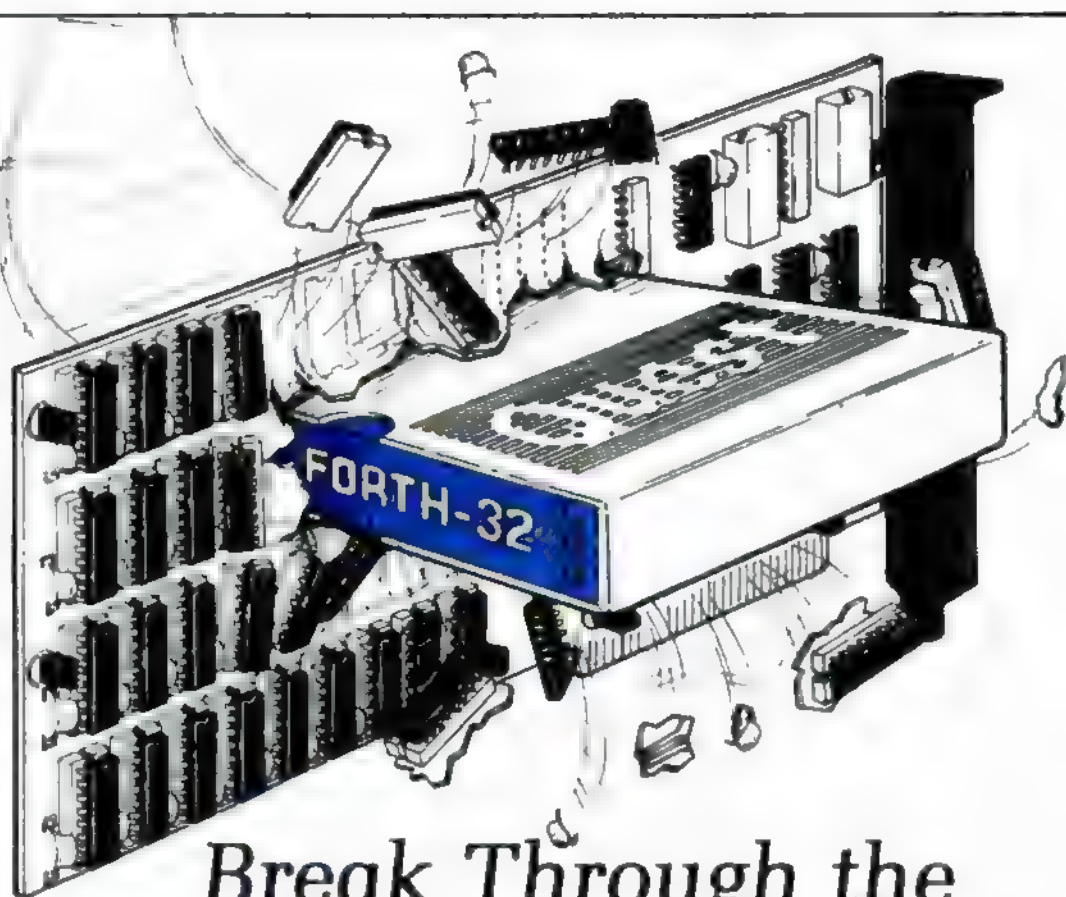
I also cannot figure out how to use the screen statements to achieve instant screen switching. My local expert claims this is impossible with the monochrome display.

Lastly, is there a way of setting a window on the display so that six or seven lines of text can be set at the top of the screen without having them scroll away? I would like to use the built-in scrolling of the IBM and not have to write my own scroll routine.

Peter Krouwer
St. Louis, Missouri

A: There is no simple way to store an underlined word in memory, assuming you want to use the PRINT statement to redraw the word. If you are willing to use POKEs, then it can be done. The simplest method is to store the attribute of each character alongside the character itself. Each string will be twice as long as you would otherwise expect.

The only way to display the string then is by POKEing (or PRINTing) the characters to the screen and then POKEing the attributes. This is a tedious process at best, in BASIC.



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You cannot use the SCREEN command to effect page switching with the monochrome adapter. It works only with the color adapter, which has eight or four

YOU CANNOT use the SCREEN command to effect page switching with the monochrome adapter.

pages of memory in 40- and 80-character-modes respectively. However, you can do fast page switching using a simple machine language routine.

As to having the PC's operating system perform scrolling, please refer to an example I included in an earlier PC Tutor (Volume 1 Number 10). That machine lan-

guage routine calls IBM's BIOS (basic input output system) scroll routine to clear a horizontal window. You can just as easily make the routine scroll a horizontal window (by setting AL<>0). I also suggest you read pages A-43 and A-44 in the IBM Technical Reference Manual.

Finally, if I may ask, why would anyone want to write a text editor in BASIC? Although BASIC has many fine applications, text editing is not one of them. You will find the project to be much easier in either Pascal, C, or even FORTH—in fact, any language with named subroutines and structure.

Manual Questions

Q: Under the heading "Sixteen Background Colors" on page I-9 of the BASIC 2.0 manual, the commands for 40- and 80-column widths are given respectively as OUT &H3D8,8 and OUT &H3D8,9. However, page 2-58 of the Technical Reference Manual shows the bits of 3D8 that control these functions to be bits 0 and 5. Why weren't the first commands OUT

&H3D8,32 and OUT &H3D8,33 instead?

Also, can I replace the 16K memory chips on my mother board with 64K chips? If so, what type would you suggest I use?

Finally, my manuals show certain keys doing things that they don't actually do. For example, the Technical Reference Manual shows Shift-TAB as reverse tab, and Ctrl-PgUp as top of text and home cursor. There are many more of these. Is this a bug in PC-DOS 2.0?

Bill Kraengel, Jr.
Valley Stream, New York

A: The 8 comes about because the video signal must be enabled in order to see anything on the screen. Hence bit 3 must be high when you output to the Mode Select Register. Next, the instructions refer to enabling a sixteenth color, not changing from 40 to 80 columns. To enable the sixteenth color you need to set bit 5 (the blink bit) LOW (0). Thus, if you were running in 40-column mode, you would send OUT &H3D8,8 where the 8 decomposes as follows:

HEX: MEANING

- (1) 80-column mode OFF
- (2) Graphics OFF
- (4) B&W OFF
- (8) Enable Video ON
- (10) 640×200 mode OFF
- (20) Blink Enable OFF
- (Background Color ON)

Next, you cannot change the 16K chips to 64K chips on the PC. The circuitry on the mother board is set up for 16K chips. There is a modification kit available, but

CREATING character fonts is a thankless and tiring job.

it requires some soldering skill and some cutting of traces on the motherboard.

Finally, those keystrokes you are referring to are only suggested by IBM so that various text editors will maintain compatibility. Microsoft and IBM themselves

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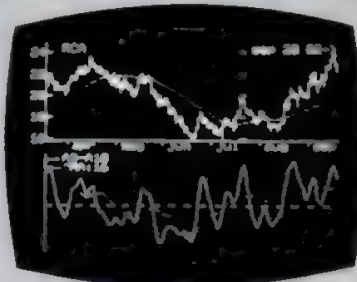
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have not included any such capability in PC-DOS or EDLIN.

Hidden Lines

Q: How can the video be shut off during an AUTOEXEC.BAT so the BASIC command display and my program name are not displayed?

Douglas F. Eilertson
Murfreesboro, Tennessee

MOST programs (even copy-protected ones) can be run without rebooting the computer.

A: The simplest approach is to use PC-DOS version 2.0 and have the first line of the AUTOEXEC.BAT file be ECHO OFF, which will turn off the display of the command lines until the autoexec is finished.

There is no other way to do this, besides having AUTOEXEC.BAT run a program which automatically loads BASIC and runs your program, or which electronically turns off the video display via an OUT & H3D8,0.

Switching Displays

Q: I have both a monochrome and a color display. It is easy enough to change between them, but when I load a copy-protected program, it reverts to the monochrome display. Is there any way to use the color display for this program without changing the switches inside the PC?

Earl Gough
Altadena, California

A: It depends on the program. Most programs (even copy-protected ones) can be run without rebooting the computer. For example, VisiCalc. Even though the VisiCalc instructions call for rebooting before running VisiCalc, you can run the program by just putting the VisiCalc diskette in drive A and typing VC80 to run the 80-column version of VisiCalc.

If the program will not run without rebooting then I know of no way to set the color display as the default without changing switches internally.

To find out if your program requires rebooting, try this out. Boot the computer and switch to the color display, then put your program disk into the A drive. Now, instead of rebooting, just type AUTOEXEC. This will run the AUTOEXEC.BAT program while keeping the color monitor active.

Unused Memory

Q: Our office purchased an IBM PC with 544K. It was only after we received it that we learned that standard BASIC will only look at 64K at a time. We have scientific programs with 1,000 lines of code and 20,000 variables that need all the 544K. Is there any advanced interpreter for sale that a non-expert can use to make the memory available?

Paul B. Blackwelder
Wadsworth, Ohio

A: If you need a BASIC interpreter, then I am afraid all the interpreters I know of allow only 64K of data area. This is one area in which the 8088 does not shine.

The internal architecture of the chip (its segmentation) make using more than 64K for a data area a relatively difficult task. Given that the ROM BASIC is primarily a translated 8080 program, using all 544K would have increased the translation task considerably.

You should be able to fit 1,000 lines of code in the 64K of available code area. Perhaps a solution would be to make a RAMdisk out of the additional (unused by BASIC) memory and then keep the larger variables in a file on the RAMdisk. Using BASIC's random access file structure, you can READ/WRITE the variables pretty easily. The RAMdisk speed will make it almost as fast as if everything were in BASIC memory, but program complexity will increase. /PC

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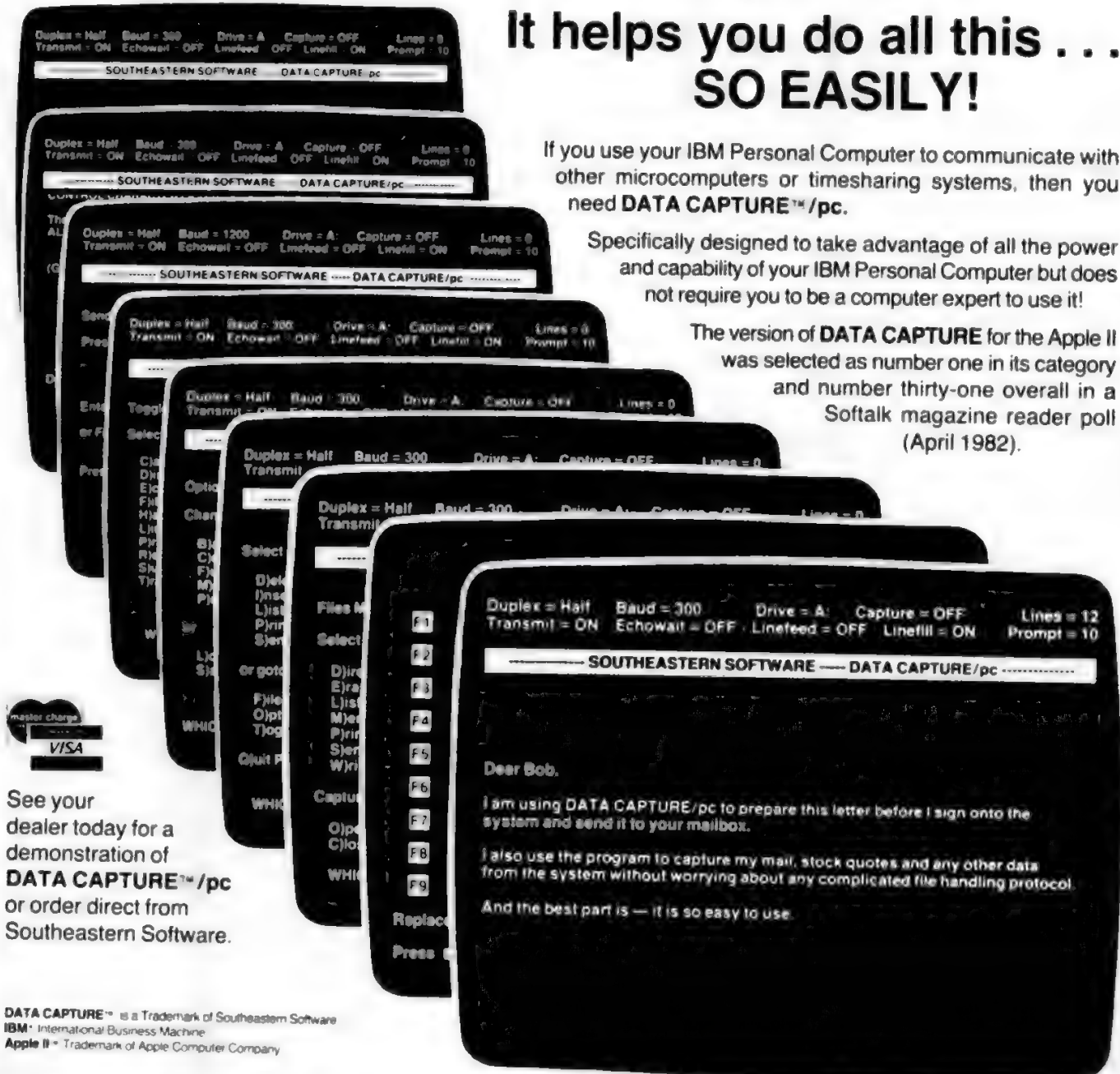
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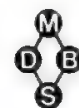
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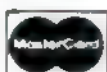
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CLUB NEWS/EDITED BY SUSAN HURLEY

Clubs, bulletin boards, and newsletters enable PC users to capitalize on their fellow users' knowledge.

PC User Groups

This list provides the names and addresses of PC User Groups worldwide. You can check this list to locate other PC aficionados in your area.

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Santa Maria, CA 93455
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PC will publish a periodic listing of PC user groups and their activities. Drop a line to Club News, PC, One Park Ave., New York, NY 10016. New groups and address changes are shown in boldface.

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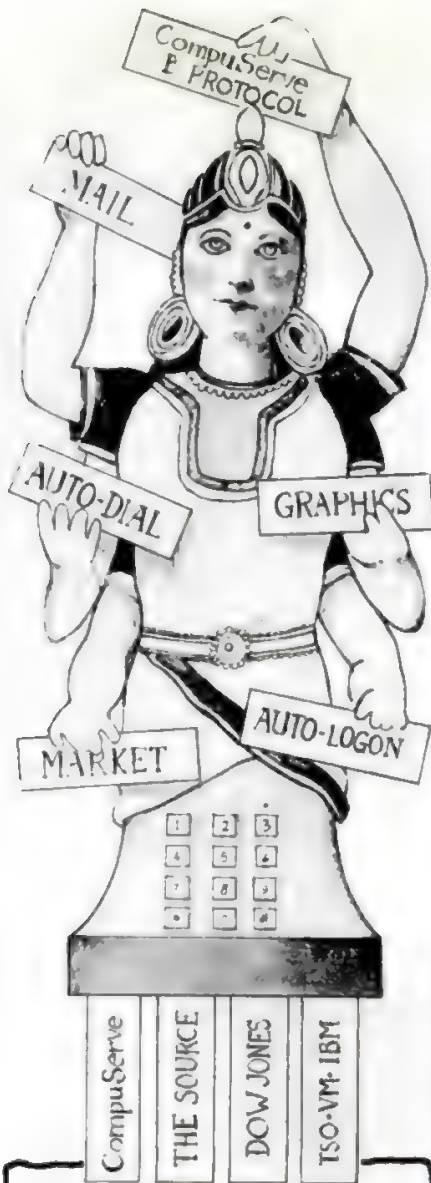
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Micro Systems Div.	10	20	20	20	120	115	240	325	450	135	120	120	1,100
Industrial Sys. Div.	25	25	30	75	100	130	160	190	225	250	300	350	1,660
Total Revenues	175	160	175	215	435	595	725	915	1,115	1,025	1,140	1,195	6,280
Cost of Sales													
Components Div.	70	70	100	110	130	165	210	345	250	485	520	485	2,100
Micro Systems Div.	15	15	20	20	55	75	100	140	185	210	220	225	1,510
Industrial Sys. Div.	25	25	30	50	75	100	125	150	175	200	225	275	1,470
Total COS	110	110	150	180	260	340	435	635	565	915	965	985	4,080
Operating Expenses													
Components Div.	100	125	150	110	130	200	200	200	200	200	200	130	1,415
Micro Systems Div.	20	20	20	20	100	100	110	110	110	110	120	120	1,010
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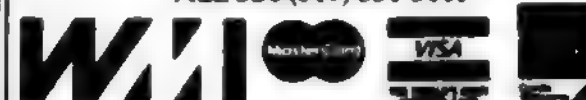
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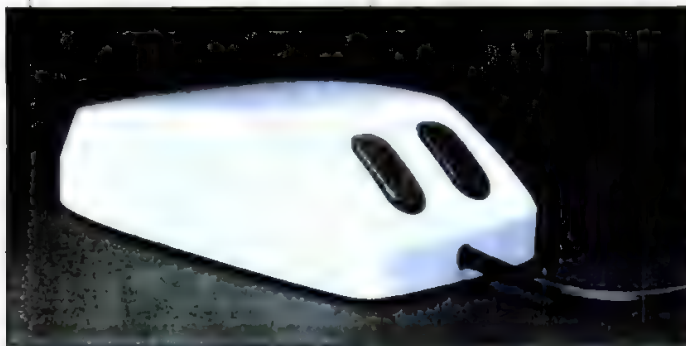
New On The Market

HARDWARE

Microsoft Mouse

A mechanical mouse for moving and positioning cursors on display screens. The device requires no special surface to move across, and is equipped with two user-definable buttons to activate decision alternatives or commands from the screen.

The Microsoft Mouse is packaged with three software programs designed to teach the use of the device. The first is a musical tutorial that teaches how to point with a mouse by moving the cursor around on a piano keyboard displayed on the screen. The user positions the pointer on a key and then presses a button, causing the computer to sound a musical note.



Microsoft Mouse, Microsoft Corp.

The second program is the *Game of Life*, designed to help users refine their skills and to acquaint them with command lines.

The third program included with the package is *Multi-Tool NotePad*, a text editor program with insert and delete features.

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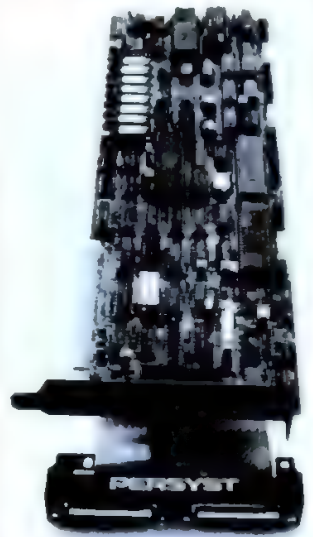
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A co-processor board, based on an 8088 microprocessor, that offers 64K bytes of dual ported RAM, up to four communications lines, and a high speed printer port. Programs written for the PC can be executed on this board simultaneously with other programs executing on the PC. Two or four channel versions are available as standard configurations, supporting asynchronous, bisynchronous, SDLC or HDLC line protocols. Full modem support is provided, as is a modem eliminator option. An optional parallel printer port can also be ordered, supporting either Centronics or Data Products interfaces.

When used with Persys's PC-HASP software, the board/software combination allows the user to transfer text, binary, or user-defined combinations of data between a mainframe and the user's system. The user may assign I/O streams to a variety of different devices, such as disks, printers, or RS-232 ports. (List Price: Basic model \$695)

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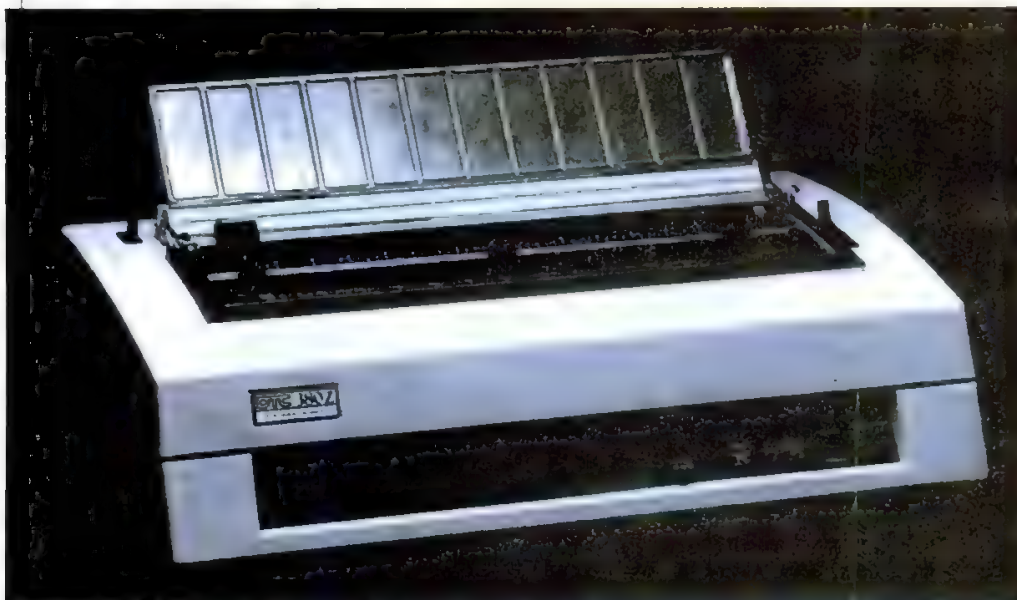
PC Magazine cannot guarantee publication of a product announcement for a particular issue. In any case, submissions of material for "New on the Market" must be received no later than seven weeks in advance of the first week of the issue month. For example, for the August issue, all material must be in our hands no later than the middle of June, approximately 2 weeks before the ad closing date.

Submissions must include retail price, distribution methods, and details of required hardware and software. Include a phone contact for both marketing and technical questions.

The details for the product announcement should be submitted in typewritten form, double-spaced on one side of the paper. Whenever possible, include 8x10 glossy photograph of the product in black & white or color. If applicable, include screen photographs. For best quality, direct camera screen images are preferable to photographs from the monitor.

All material should be sent to: **New on the Market, PC Magazine,** 1 Park Ave., New York, NY 10016.

New On The Market



DTC 380Z Printer, Data Terminals & Communications

DTC 380Z Printer

A daisy wheel printer incorporating a 48K character buffer memory and print speed up to 32 characters per second. Other features include full bi-directional printing, proportional spacing, serial and parallel interfaces, Diablo-compatible software, graphics plotting, 50 to 19.2K baud input capacity, and a momentary pause capability for paper, printwheel, and ribbon changing.

The printwheel is available in different fonts and works with standard ribbons. A self-diagnostic routine tests the unit and its internal CPUs while the printer is isolated from the user's system. Error conditions are indicated by status lights.

Optional extras include a sheet feeder, forms tractor, type fonts, and interconnecting cables. (List Price: \$1,495)

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Strobe 260 Graphics Plotter

An automatic six pen plotter that allows the user to plot graphs and charts utilizing up to six different colors with automatic pen changes. Included software enables the user to preselect colors before initiating the plot. At appropriate times during

plotting, the pen change routine is automatically invoked to change pens without further interaction from the user. The pens (supplied) are held in a cartridge. Each color pen is individually replaceable.

Software for the Model 260 allows the user to generate high resolution bar charts, pie charts, and line graphs (500 steps per inch in both the X and Y directions). Alphanumerics are also included for labeling the charts or creating pages of text. (List Price: \$995)
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Micro Slave

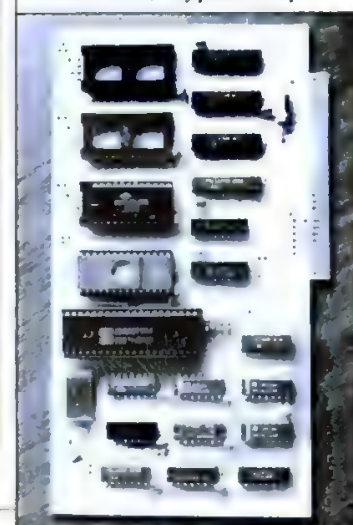
A Z-80A based co-processing board that can be addressed through the user's system's I/O ports and operates independently of the system. Features of the board include a 4 MHz clock, four 28-pin sockets for use with EPROMs or RAMs, two 8-bit input latches for data or commands, two 8-bit output latches with flag bits for data or status, as well as a Z-80A microprocessor.

Three configurations are available, offering additional memory, data encryption algorithms, program protection packages, and multi-user access. (List Price: \$271-\$534, depending on configuration)

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(206) 364-8585

CIRCLE 777 ON READER
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Micro Slave, Cryptext Corp.



Personal PENPAD

A data input device that converts handprinted data to computer code as it is being written. Consisting of a digitizing pad, pen, and monitor, the device allows business forms and similar preformatted material to be filled out and inputted into the system file either simultaneously or in a buffered mode.

The PENPAD will accept a wide latitude of print styles, analyzing the movement of the pen as it is used and displaying the result in ASCII characters on the screen. To make corrections, the user can write over or use a delete symbol.

Four modes of operation are available to the user. In Line Buffered Mode, handprinted characters are transferred to the file as they are written. Page Buffered Mode allows the user to load an entire filled-out form at one time. Character Coordinate Mode allows the PENPAD to operate in full-duplex with the user's system, working within a user-defined grid to locate characters on-screen as they are created. In Graphics Input Mode, the device works as a digitizer, allowing both text and graphics to be entered. (List Price: \$3,500)
Pencept, Inc.
39 Green St.
Waltham, MA 02154
(617) 893-6390

CIRCLE 710 ON READER
SERVICE CARD



Koalapid Touch Tablet, Koala Technologies

Koalapid Touch Tablet

A touch tablet and supporting software that allow the user to draw directly on a display screen, bypassing the keyboard. The tablet connects to the user's system via a single cable. The user draws on the tablet with finger or stylus, creating an image that appears on the display screen. The user can also select, with the appropriate software, various shapes, shadings, and "paint brushes" from a menu to create images on the screen. (List Price: \$125; additional programs \$50)
Koala Technologies Corp.
4962 El Camino Real, #125
Los Altos, CA 94022
(415) 964-2992

CIRCLE 779 ON READER
SERVICE CARD

AMDISK-V Disk Drive

A double-sided, double-density floppy disk drive that is plug-compatible with standard 5¼-inch drives, but occupies only half the space. The units can be internally mounted in the user's system. Recording format, data transfer rate, and disk rotation speed are identical to industry-standard 5¼-inch drives. (List Price: \$399)
Amdek Corp.
2201 Lively Blvd.
Elk Grove Village, IL 60007
(312) 364-1180
Telex: 25 4786

CIRCLE 776 ON READER
SERVICE CARD

AMDISK-V Disk Drive, Amdek Corp.



Quickon

A device to speed the time it takes to bring a user's system up to operating condition. The unit causes the system to skip RAM tests, making the disk drive come on in approximately three or four seconds, regardless of the size of memory.

It is installed by removing the system's BIOS ROM, plugging the ROM into the device, then plugging Quickon into the ROM's socket. (List Price: \$49)
Security Microsystems
16 Flagg Pl. #102Q
Staten Island, NY 10304
(212) 667-1019

CIRCLE 722 ON READER
SERVICE CARD

New On The Market

Type & Print Typewriter Interface

An interface device capable of converting standard Olivetti Praxis 30 and 35 portable typewriters into letter quality computer printers. The device allows the portable typewriter to be disconnected from the user's system for continued use as a typewriter.

Used with a Praxis Model 35 typewriter, the device allows a condensed type font. (List Price: \$179)

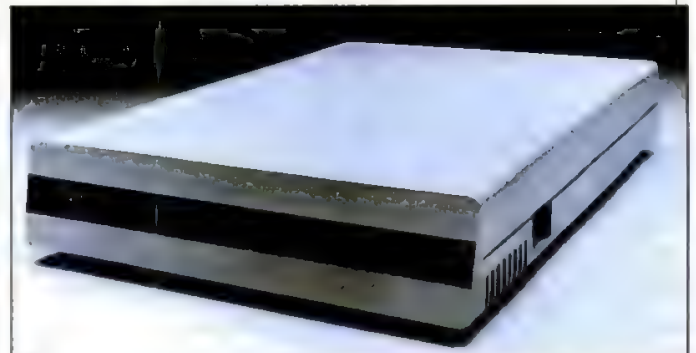
Requires: Centronics-type parallel port, cable. Applied Creative Technology, Inc.

2723 Ave. E East, #717
Arlington, TX 76011
(800) 433-5373
(817) 261-6905

CIRCLE 778 ON READER
SERVICE CARD

IRMALINE and IRMALETTE

A self-contained protocol converter allowing communications between a user's system and an IBM 3270 controller over standard phone lines. IRMALINE is linked to the controller via a coaxial cable. The device provides asynchronous data in IBM 3101 or DEC VT100 format, and allows a user's system emulating these terminals to communicate with and capture data from the mainframe system as an IBM 3278 display.



IRMALINE, Technical Analysis Corp.

An optional companion product to IRMALINE, the IRMALETTE Asynchronous Interface Card, provides selective data transfer and capture capabilities, and can work with any software developed for use with the IRMA communications board. (List Price: IRMALINE \$1,395; IRMALETTE \$325)

Requires: IBM 3101 or DEC VT100 Terminal Emulator software, asynchronous adapter or IRMALETTE. Technical Analysis Corp. 120 W. Wieca Rd., N.E. Atlanta, GA 30042 (800) 241-IRMA (404) 252-1045 Telex: 54 9600

CIRCLE 790 ON READER
SERVICE CARD

Graphics ConvertaBuffer

A printer buffer that allows the user to produce business graphics generated by such programs as 1-2-3 and MBA on letter quality printers. The Graphics ConvertaBuffer translates the Epson Grafrux graphics data output from the software into the format necessary for printing on a letter quality printer.

The device can accept data from the user's system at rates up to 1K characters per second, storing up to 64K bytes of data in its memory. It features a buffer-clear button on the front panel and a status light indicating when the unit has automatically switched into the graphics mode. Units are equipped with built-in cables and power supply. (List Price: \$499) von Leivendyke Enterprises Silvermine Ave. Norwalk, CT 06850 (203) 846-4973

CIRCLE 723 ON READER
SERVICE CARD

Type & Print Typewriter Interface, Applied Creative Technology



SuperVision Interface Board

A plug-in board offering the ability to display spreadsheet data on-screen in 132 columns by 44 rows deep. Additionally, with a graphics adapter, the board can generate dot-addressable graphics of up to 720 by 348 dot format.

The SuperVision board includes a parallel port compatible with IBM's monochrome board. Also included is a full-screen editor which operates in both 80 column and 132 column modes. (List Price: \$795) California Computer Systems

250 Caribbean Dr.
Sunnyvale, CA 94086
(408) 734-5811
Telex: 17 1959 CCS SUVL

CIRCLE 796 ON READER
SERVICE CARD

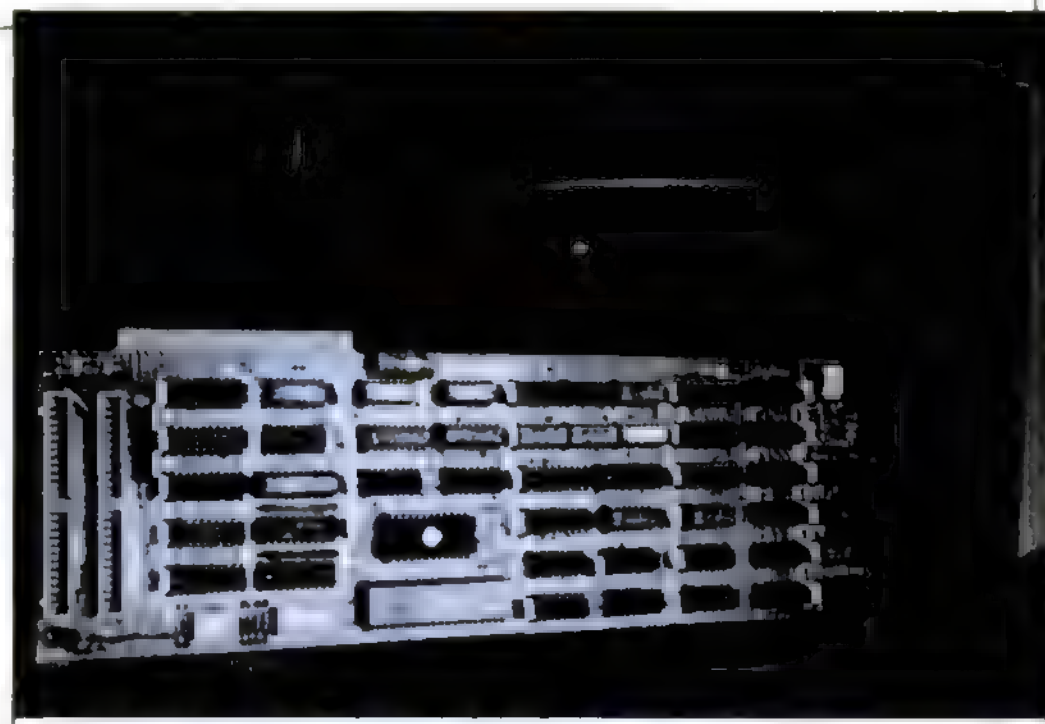
Z-Plus Co-processor Board

A Z-80 co-processor board which enables the user to execute CP/M 2.2 or 3.0 programs, making available software programs not available to PC-DOS or CP/M-86 users before.

The Z-Plus board has a Z-80B microprocessor, up to 192K bytes of dual-ported memory, and an asynchronous communications interface. When the Z-80 is not in use, the memory may be accessed by the user's 8088 processor. Parity checking is used by both the Z-80 and the 8088. The asynchronous communications port may be configured as either COM1 or COM2. Under CP/M 2.2, 64K bytes of memory are used; with CP/M 3.0, 192K are available. Osborne floppy disk formats are also supported.

(List Price: \$795)
California Computer Systems
250 Caribbean Dr.
Sunnyvale, CA 94086
(408) 734-5811
Telex: 17 1959 CCS SUVL

CIRCLE 797 ON READER
SERVICE CARD



ITC-PC 9-Track Drive, Alloy Computer

Versa-RAM Plus II, Model 512M-XAP

A modular multifunction expansion board featuring a clock/calendar/alarm, VersaWare RAM-DISK/Spooler software, clock/calendar support software, and a diagnostics utility program. The board comes with 64K RAM standard, expandable to 256K onboard, or to 512K through add-on modules.

With the plug-in memory modules, the user can add also one of several other function modules, such as a 64K printer spooler, a second asynchronous communications port with optional game adapter, a synchronous SDLC/HDLC communications port, color graphics adapter, and a floppy disk controller. (List Price: Basic 64K unit \$429) Memory Technologies, Inc.
4343 Grand Prix Dr.
P.O. Box 508
Logansport, IN 46947
(219) 722-1454

CIRCLE 787 ON READER
SERVICE CARD

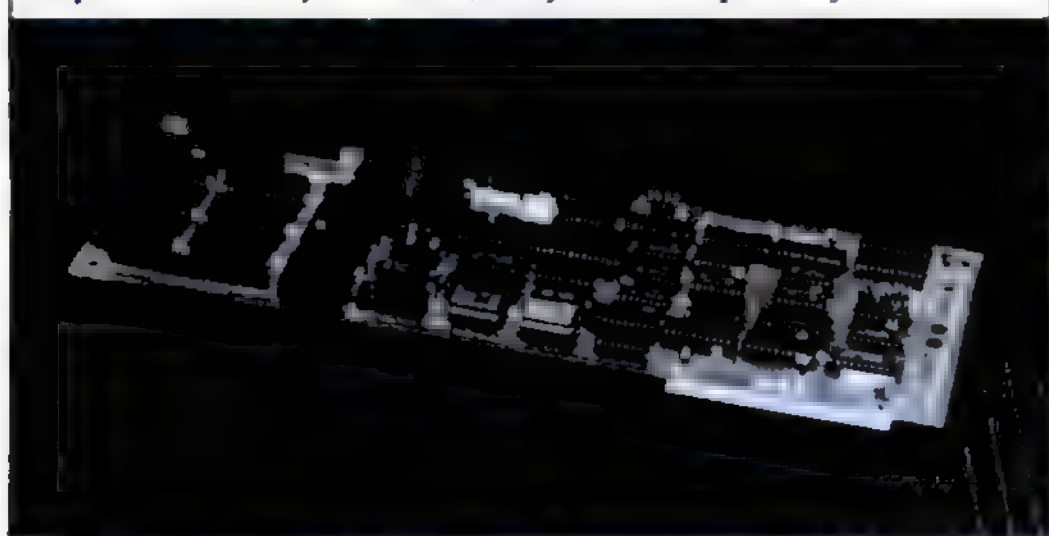
ITS-PC 9-Track Tape Drive

A 9-track controller and tape drive offering 42 megabytes of working or backup storage, and a disk-tape transfer rate capability of one megabyte per minute. The device can support 1600 BPI tapes with user-specified formats from 128 to 9K bytes per block.

The ITS-PC 9-track drive is available with or without an integrated Cipher tape drive, and includes PC-TIP (Tape Interchange Package) software, which controls reading, writing, and dumping operations. PC-TIP also provides utilities that enable users to customize their own drive operations. (List Price: \$6,995) Alloy Computer Products
12 Mercer Rd.
Natick, MA 01760
(617) 655-3900

CIRCLE 789 ON READER
SERVICE CARD

SuperVision Interface Board, California Computer Systems



New On The Market

PC-BACKUP Cartridge Drive

A 4-track, 6,400 BPI cartridge tape drive that can accommodate 13.4 megabytes of data per 450 feet of tape, and 16.5 megabytes on the 555 cartridge.

The unit includes PC-TIP (Tape Interchange Package) software that controls reading, writing, and dumping operations. (List Price: \$1,995)

Alloy Computer Products
12 Mercer Rd.
Natick, MA 01760
(617) 655-3900

CIRCLE 788 ON READER
SERVICE CARD



SC821 Smart Cable, IQ Technologies

The Sysgen Image

A streaming cassette tape backup device for the IBM PC/XT. The device includes controller, drive electronics and tape drive. It is compatible with either PC-DOS or CPM-86, and can perform archival backup of data on a

hard disk at the rate of up to 2.5M bytes per minute. Storage capacity is 20M bytes.

The Image gives the user a choice of two backup modes. PRESERVE backs up data from an individual disk volume and restores the data on an individual disk volume in an image fashion. An additional catalog utility scans the entire streaming tape to list all files by tape-file I.D., size, and other categories.

FILESAVE allows individual files or groups of files to be saved from the hard disk to the streaming tape or vice versa. The catalog utility gives the user the choice of all files on tape, a specific range of files, or a particular file. (List Price: \$995)

Sysgen, Inc.
47853 Warm Springs Blvd.
Fremont, CA 94539
(415) 490-6770
Telex: 49 90843

CIRCLE 785 ON READER
SERVICE CARD

SC821 Smart Cable

An RS-232C interface cable incorporating onboard logic circuitry. It connects all handshake lines used in specific applications, and can function at baud rates up to 19,200. Indicator lights are acronyms for the following conditions: Data Terminal Ready, Data Sent Ready, Clear To Send, Ready To Send. These indicators, as well as two more, for Modem and Terminal, aid the user in locating which device is disabling data transfer in the event a hardware or software problem should exist. (List Price: \$245)

IQ Technologies, Inc.
11811 N.E. First St., #308
Bellevue, WA 98005
(206) 451-0232
TWX: 910-443-2308

CIRCLE 786 ON READER
SERVICE CARD

PC-BACKUP, Alloy Computer Products



Smartmodem 1200B and Smartcom II

A board modem that can operate at transmission speeds of 300 or 1200 bps. Functionally equivalent to the Hayes Smartmodem 1200 with an asynchronous adapter, the 1200B is designed to fit within the user's system, eliminating the need for a separate communications card. A telephone jack on the board permits a direct connection to a telephone line on either touchtone or pulse dialing system. Both types of dialing may be used simultaneously in one call. A speaker, with volume control, mounted on the board, allows a user to hear the progress of a call.

Packaged with the 1200B is Smartcom II, a program controlling data transfer and

which allows the use of a printer and disk drives while on-line with another computer. It is supported by "help" screens displayed on demand to clarify a parameter, prompt, or message. The program divides data into units called Macros. One Macro is reserved for automatic log-in; up to 26 Macros and variable parameters may be stored for each remote system called. The program disk is pre-programmed with Macros for several commercial information services.

(List Price: \$599)

Hayes Microcomputer Products, Inc.
5923 Peachtree Industrial Blvd.
Norcross, GA 30092

(404) 449-8791

CIRCLE 795 ON READER
SERVICE CARD

PCnet

A hardware/software package that allows up to 128 users to link their systems into a common local area network. The hardware consists of a single-slot PCnet Adapter board that plugs into each user's system. The board incorporates a plug for 75-ohm coaxial cable that can run up to 7,000 feet, and provides a data transmission speed of approximately 1 megabit per second.

Each Adapter comes with software that integrates the network into MS-DOS. This MS-DOS interface is designed to allow standard single-user applications to run without disconnecting from the network. The software allows for disk sharing, file locking (restricting access to a file to one user at a time), multi-tasking, and printer sharing functions. The multi-tasking feature allows a user on one system to run commands on another system by remote. Thus one system can act as an "execution server" for the other systems and can print files, assemble programs, and format text while the other systems perform other work. (List Price: Adapter Card \$695; complete two-system Starter Kit \$1,490)

Orchid Technology, Inc.
487 Sinclair Frontage Rd.
Milpitas, CA 95035
(408) 942-8660

CIRCLE 719 ON READER
SERVICE CARD



Targa II Hard Disk Drives,
CMC International

Targa II Hard Disk Drives

A hard disk drive unit available in three models. The first is a single drive only device with three formatted storage capacities of 5, 10, or 15 megabytes. The second offers the same configurations, but provides a slot to allow the user to add a second comparable drive as the need arises. The third model offers the user room to install five additional I.B.M. expansion cards as computing needs increase. (List Price: Model 1 with 5 Mb \$1,490, to Model 3 with 15 Mb \$2,445)

CMC International
CMC International Building
1720 130th Ave. N.E.
Bellevue, WA 98005
(206) 885-1600
Telex: 15 2556 TAC

CIRCLE 717 ON READER
SERVICE CARD

Smartmodem 1200B & Smartcom II, Hayes



New On The Market



Command Control Mouse, Wico Corp.

Command Control 50-2111 Mouse

A mechanical mouse that is ergonomically designed to fit a user's hand. It incorporates optically-coded wheels that do not require a grid pad. Three pushbuttons located at the bottom of finger wells provide the user with a wide range of user-defined command options. (List Price: \$99.95)

Requires: Model 50-2070 Controller Card.

Wico Corporation
Consumer Div.
6400 W. Gross Point Rd.
Niles, IL 60648
(800) 323-4014
(312) 647-7500
Telex: 28 9413

CIRCLE 721 ON READER
SERVICE CARD

TEAC 5¼" Disk Drive

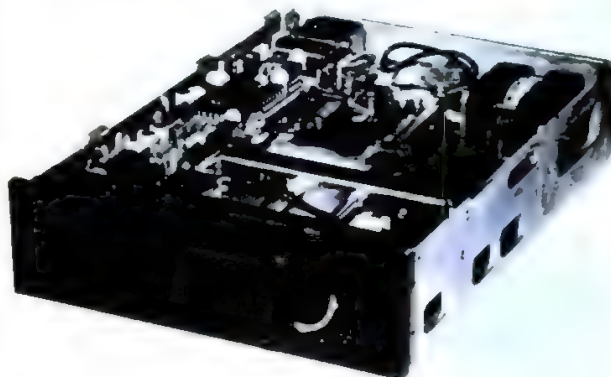
A half-height, 5¼-inch disk drive featuring low power consumption, low heat generation, and a low-noise, brushless DC direct drive motor.

Its half-height configuration allows four units to be fitted into the space of two conventional height units.

(List Price: \$290)
Maynard Electronics
400 E. Semoran Blvd., #207
Casselberry, FL 32707
(305) 331-6402

CIRCLE 794 ON READER
SERVICE CARD

TEAC 5¼" Disk Drive, Maynard Electronics



Xacom Series 8 Winchester Drives

Two Winchester-type hard disk drives. The Model 810 features a single 8-inch 10.6 megabyte removable cartridge. It is designed as a backup storage unit. More than one user system may be linked to the drive simultaneously.

The Model 853 fixed drive can provide formatted storage capacity from 10.6 MB to 84.8 MB. Both models provide automatic seek and verify, automatic head and cylinder switching, and sector interleaving. (List Price: 810: \$4,550; 853: \$7,800)

Xacom Technology Inc.
560 Forbes Blvd.
South San Francisco, CA 94080
(415) 952-1512

CIRCLE 781 ON READER
SERVICE CARD

AJ 1211 Modem

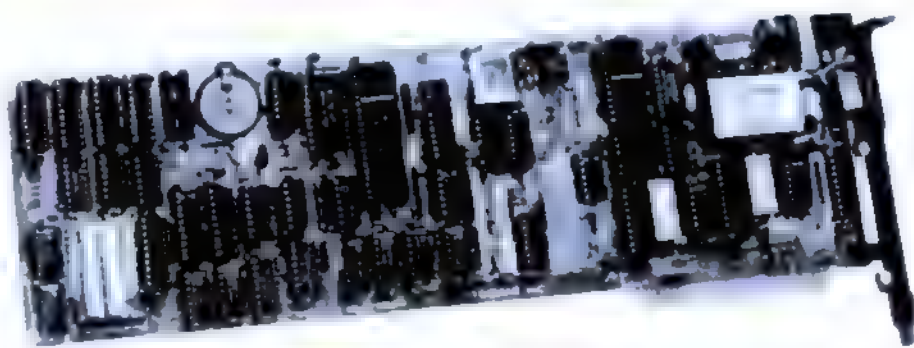
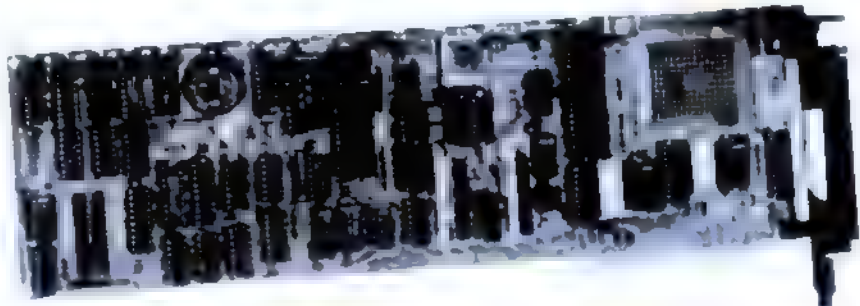
A combined 300/1200 baud modem compatible with Bell 103/212A dial-up communications modems. The modem is available in three configurations. The AJ 1211 is a stand-alone, full duplex modem with auto answer capabilities for unattended operation. The AJ 1211-AD is the same, but with an auto-dialing feature that allows a user to enter phone numbers into memory, eliminating the need for a telephone on the data line.

The AJ 122-RM is available as a modem card for mounting in equipment racks such as the AJ Series 8 Multiple Modem System.

All units connect to phone lines through either standard RJ-11C modular jacks or RJ-41S and RJ-45S data jacks. An internal microprocessor within the unit continuously performs self-tests and diagnostic analysis. When answering calls, the modem is capable of automatically selecting the proper protocols and data transfer rates.

Internal memory will hold 10 telephone numbers, individually re-programmable. (List Price: AJ 1211 \$625; AJ 1211-AD \$675; AJ 1211-RM \$645)
Anderson Jacobson, Inc.
521 Charcot Ave.
San Jose, CA 95131
(408) 286-7960

CIRCLE 665 ON READER
SERVICE CARD



2ndMATE & 3rdMATE Boards, Tecmar

Tecmar 2ndMATE and 3rdMATE Boards

Two plug-in multifunction boards. The 2ndMATE card provides the user with two serial ports, two parallel ports, a real time clock/calendar with independent battery, serial and parallel cables, and support circuitry for an optional PAL (programmable array logic) device.

The 3rdMATE card offers a 300 baud direct connect auto-answer modem with a standard RJ-11 jack, a serial port, two parallel ports, a battery-powered real time clock/calendar, PAL support circuitry, and serial and parallel cables.

The PAL device can be used to provide the user's system a unique I.D. that can help protect software or restrict access to user's files. (List Price: 2ndMATE \$295; 3rdMATE \$445)

Tecmar, Inc.
23600 Mercantile Rd.
Cleveland, OH 44122
(216) 464-7410
Telex: 24 1735

CIRCLE 793 ON READER
SERVICE CARD

Tecmar Mini-cabinet Memory Drives

Five versions of mass memory storage in a mini-cabinet aesthetically matched to the IBM PC. The drives include 10 Megabyte, 15 Megabyte, and 26 Megabyte (formatted storage) Winchester drives; a 5 Megabyte removable-cartridge Winchester; and a 6.25 Megabyte Bak-Pak multiple-floppy-stack drive designed for backup of programs on hard disk drives.

The fixed and removable-cartridge Winchesters include a PC-Mate Winchester Share Adapter, which provides resource sharing, allowing as many as four systems to share a single Winchester unit. Also included are software utilities, as well as built-in power supplies and cables. (List Price: 10 MB \$2,495; 15 MB \$2,895; 16 MB \$3,995; 5 MB removable cartridge drive \$1,995; cartridges \$90; 6.25 MB Bak-Pak \$1,595; Disk packs \$95)

Tecmar, Inc.
23600 Mercantile Rd.
Cleveland, OH 44122
(216) 464-7410
Telex: 24 1735

CIRCLE 792 ON READER
SERVICE CARD

Linkup

A communications hardware/software package featuring a programmable plug-in board which supports all industry-standard protocols and emulates terminals at data rates of up to 56,000

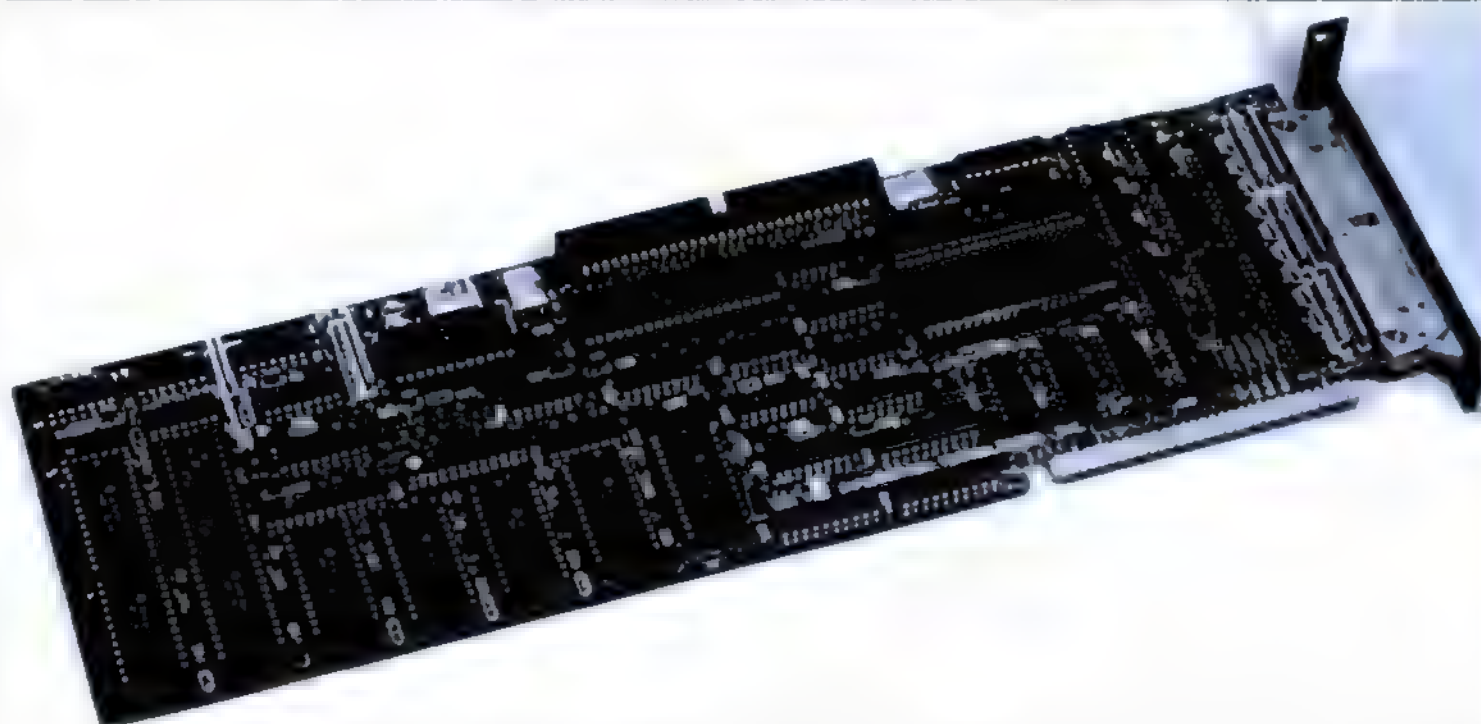
baud-per-second.

Linkup software options offers TTY, DEC VT52/100, IBM 3101, IBM 2780/3780 emulation, ASCII Block Protocol, and a print spooler. Linkup provides unattended operation, and the package allows the user to communicate with other systems by entering only the telephone number and password for the other system. By pressing a single key, the protocol and terminal configurations are established. These configurations are stored on disk for each number called. (List Price: Board with TTY and ASCII Block Protocol \$795; Software options \$195 each)

Requires: Modem.
Information Technologies, Inc.
7850 E. Evans Rd.
Scottsdale, AZ 85260
(602) 998-1033

CIRCLE 791 ON READER
SERVICE CARD

Linkup, Information Technologies



New On The Market

Microbuffer Printer Interfaces

A series of serial and parallel printer interfaces for Epson printers. The boards, designated MBS-8K, MBS-16K, MBP-16K, and MBP-32K, allow for simultaneous printout and continued use of the computer.

The MBP-16K, designed for parallel printers, contains 16K bytes of RAM. The MBP-32K contains 32K, expandable to 64K. The MBS-8K is intended for use with serial printers and contains 8K bytes of RAM, while the MBS-16K has 16K and is expandable to 32K or 64K.

In all units, data is held in the internal memory and sent to the printer at baud rates from 300 to 19,200. The boards support all Epson commands, and are compatible with Grafrax-80 and Grafrax-80+. The boards plug into the existing auxiliary interface connector

within the printer without modifications. (List Price: MBS series \$159 to \$219 depending on RAM; MBP series \$159 to \$279; plug-in additional RAM module for MBS-16K & MBP-32K \$89) Practical Peripherals, Inc. 31245 La Baya Dr. Westlake Village, CA 91362 (213) 991-8200

CIRCLE 724 ON READER SERVICE CARD

Microbuffer In-Line Buffer

A printer buffer with up to 256K memory, available with either serial or parallel interface. The device can provide buffering for a variety of output devices including serial or parallel printers, modems, typesetting equipment, word processors, plotters, and remote data entry. The serial unit allows user to select nine different baud rates, from 75 to 19,200.



Microbuffer In-Line Buffer. Practical Peripherals

A COPY feature allows printing of up to 255 copies without tying up a user's system. New data can be sent to the buffer at any time without affecting the copy process. A PASS feature, available on the serial model, allows data to bypass the buffer. (List Price: 32K \$299; 64K \$349; additional memory modules available at \$179 per 64K) Practical Peripherals, Inc. 31245 La Baya Dr. Westlake Village, CA 91362 (213) 991-8200

CIRCLE 709 ON READER SERVICE CARD

MicroGate and MicroGate II

Two integrated hardware/software packages that allow an IBM-PC to emulate an IBM 2780 or 3780 terminal using 2780/3780 BSC communications protocol. MicroGate and MicroGate II are configurable for different operating environments, modes, and functions, and

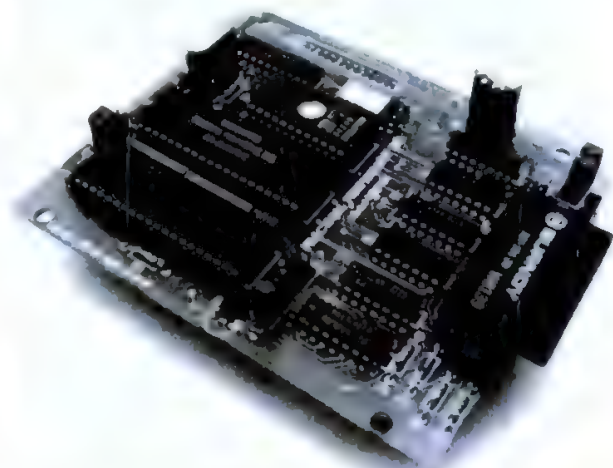
allow users to choose between transparent or non-transparent communications, interactive and batch operations, and absolute and conditional branching in batch command streams.

In addition, the MicroGate II can be set to operate under the control of a user-written program, enabling communications to take place unattended between the user's system and the mainframe system. (List Price: \$895)

Requires: 64K, one disk drive, PC-DOS, 80-column display, modem. Gateway Microsystems, Inc. P.O. Box 10998 #542 Austin, TX 78766 (512) 250-9795

CIRCLE 783 ON READER SERVICE CARD

Microbuffer Printer Interface. Practical Peripherals



The Genius

An RS-232 version of the Genius full-page display, which can produce a complete screen in less than three seconds. The full-page screen consists of 4,560 characters, 57 lines by 80 characters.

The RS-232 interface functions at up to 19.2K baud, and all interface functions are controlled by a Z-80 microprocessor. Internal memory of 16K bytes provides buffering and a built-in screen memory.

The Genius display is available with white, green, or amber phosphors and provides reverse video and flashing capabilities. A 128-character ASCII generator is incorporated within the unit, with the U.S. set standard and German, French, or International European sets available as options.

(List Price: \$1,795)

Micro Display Systems, Inc.
P.O. Box 455

Hastings, MN 55033

(612) 437-2233

Telex: 29 0766

CIRCLE 720 ON READER
SERVICE CARD



The Genius, Micro Display Systems

SOFTWARE

FAMILY ROOTS

A family-genealogy program consisting of six modules and seven utilities. **EDIT** stores basic information for each family member (date and place of birth, death, address, parents, children, spouses, etc.). **SEARCH** examines data stored by **EDIT** to find requested information.

TEXT allows the user to store notes regarding family members, without character limitation. **CHARTS** prints descendant charts plus three types of pedigree charts. **SHEETS** prints all information on one person in a single page format and also prints a family grouping

sheet. Controls allow the user to select formatting and data to be included in the printout.

LISTS prints alphabetized and/or numerically ordered lists of names for as few or as many names as are needed. Finally, **UTILITIES** generates address lists, sorts and rearranges member I.D. numbers, and prints blank charts.

The program modules and utilities are written in BASIC and allow user modifications. (List Price: \$185)

Requires: 96K, one disk drive, PC-DOS 1.1.

Quinsept, Inc.
P.O. Box 216
Lexington, MA 02173
(617) 862-0404

CIRCLE 774 ON READER
SERVICE CARD

PCAT

A program designed to automate telephone marketing. PCAT stores the name, address, phone number, and user-defined data for each client to be called. It can schedule call lists by date and time along with user-defined priorities, and then place these calls sequentially. PCAT also reschedules busy or no-answer calls, and can display a prompter script for qualifying prospects or to assist in taking orders.

The program handles local, long-distance, international, or network dialing. Directly accessible word processing functions enable the user to generate letters, memos, order configurations, etc., during the course of the phone call. (List Price: \$680)

Requires: 128K, two disk drives, 80-column monitor, Hayes Smartmodem or Novation Smart-Cat modem, printer.

Arlington Software Systems
97 Bartlett Ave.
Arlington, MA 02174
(617) 641-0290

CIRCLE 771 ON READER
SERVICE CARD

New On The Market

Farm Weather Center

A system of integrated program modules to aid the user in crop management and seasonal seed selection, pest control, and simulations of field conditions for optimal planting.

The system is composed of a core disk for main programs with separate disks for each specific crop. Crops currently available include corn, soybeans, spring wheat, and winter wheat. The integrated programs utilize temperature, precipitation, and three additional weather variables to produce estimates of crop development, soil moisture, and crop stress. Daily weather data are entered by the user, with editing, processing, and reporting functions controlled by menus.

Separate versions of the systems are available for irrigated and non-irrigated farms. (List Price: Core disk \$295; crop disks \$125 for non-irrigated versions, \$245 for irrigated versions) **Requires:** 128K, two disk drives, graphics adapter. Climate Assessment Technology, Inc.

11550 Fuqua, #355
Houston, TX 77034
(713) 484-3603

CIRCLE 770 ON READER
SERVICE CARD

Medical Office Management System

A program for medical practices of up to ten physicians. The program covers accounts receivable, appointment scheduling and patient recall, and claim form preparation.

A private billing element of the program allows for time-of-service billing of patients on either a cash only basis or partial payment basis. Extended billing includes monthly bill printing, an on-demand account review with current data reporting, and special group billing at different times of the month. Daily transactions are printed to a daily log together with full accounting and fee productivity analysis listed by doctor. The program can support up to five printers under PC-DOS 2.0. (List Price: \$795.95)

Requires: 128K, two disk drives, 132-column printer. CMA Micro Computer
55722 Santa Fe Trail
Yucca Valley, CA 92284
(619) 365-9718

CIRCLE 773 ON READER
SERVICE CARD



Medical Office Management System, CMA

Volkswriter International Edition

A multilingual version of the Volkswriter word processing program, capable of typing text in English, French, German, Spanish, and Italian interchangeably.

The International Edition allows the user to assign foreign character values to standard keyboard keys. Scientific, engineering, and special foreign characters can be printed with a standard daisy wheel printer, as the program uses a pre-set "default character" double-strike printing technique to create these characters. (List Price: \$225)

Requires: 64K, one disk drive, PC-DOS, printer. Lifetree Software, Inc.
411 Pacific St. #315
Monterey, CA 93940
(408) 373-4718

CIRCLE 775 ON READER
SERVICE CARD

StretchCalc

An integrated extension program for VisiCalc that allows users to generate any of eight different types of graphs and charts. StretchCalc also allows manipulation of columns and rows with sort and rearrange commands.

All VisiCalc functions remain unchanged and none are duplicated. StretchCalc features a Keysaver Command Facility, allowing users to repeat sequences frequently used by striking a single user-defined key. (List Price: \$99)

Requires: 128K, one disk drive, color/graphics adapter, display, IBM or Epson printer with Grafrax. Multisoft Corp.
14025 SW Farmington Rd.
Beaverton, OR 97005
(503) 626-4727

CIRCLE 772 ON READER
SERVICE CARD

Ideal APL

A new implementation of the APL language, written in 8088-8086 code, designed to directly address one megabyte of memory and to allow for object sizes of more than 64K elements. Numeric data types have been extended to allow binary, octal, and hex, as well as logical and decimal. The literal data type has been extended to allow word elements. Mixed elements are also permitted.

Ideal APL allows full screen editing, page input, and control over color, sound, and graphics. A 255 character set can be generated from the keyboard and can be set through APL. Fifteen other character sets including bit and type paired terminal types can also be used.

Sixteen output devices are supported and the exact combination may be specified and altered from a function line. *Ideal APL* also features a file system that allows ten groups of storage devices with a maximum of nine identical devices in each group. (List Price: APL character ROM for IBM

monochrome board or Epson printer, \$95; educational version for educational institutions, \$295; professional version, \$495; mini manual, \$8; full manual, \$38; updates, \$50 each) **Requires:** 128K RAM.

Ideal Computer Systems
68 Robie St.
Fundy Trail Mall
Truro, Nova Scotia B2N 1K8
Canada
(902) 895-8062
DATAPAC 7735021

**CIRCLE 763 ON READER
SERVICE CARD**

The DOCUMENTOR

A utility program that can provide the user with a detailed flowchart of any program written in IBM-PC Disk or Advanced BASIC. The DOCUMENTOR can print out branch maps to allow the user to determine the order of program flow.

Printouts from a graphics printer will be in block format, and the program is compatible with color displays. (List Price: \$49.95) **Requires:** 64K, one disk drive, MS-DOS, monitor, printer.

P80Nut Software
P.O. Box 490
Lilburn, GA 30247
(404) 469-0056

**CIRCLE 768 ON READER
SERVICE CARD**

Versa-Ware RAM Disk and RAM Spooler Programs

Two programs that use part of the user's system memory to emulate a disk drive or print buffer. *RAM Disk* uses either 160K or 320K bytes to emulate either one or two disk drives (drive C and D). To the DOS 1.1. operating system, these emulated drives appear identical to the system's internal drives with the exception that they operate at higher processing speeds.

RAM Spooler uses system memory in 1K byte increments as a printer buffer, allowing the user to continue using the computer for other applications. (List Price: Both programs \$49.95 each)

Requires: 128K, one disk drive, monitor, printer.
Memory Technology, Inc.
4343 Grand Prix Dr.
P.O. Box 508
Logansport, IN 46947
(219) 722-1454

**CIRCLE 760 ON READER
SERVICE CARD**

BANNER

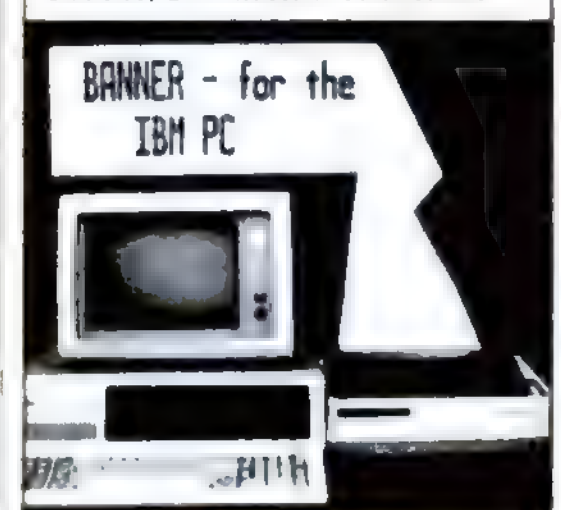
A print utility program that allows the user to print text in three-inch high block letters lengthwise on continuous forms using any parallel interface printer. The program includes upper and lower characters, numbers, and special characters. Also included is a character design editor that allows the user to modify characters and store special symbols and logos.

The banners can be up to six feet in length. (List Price: \$32.95)

Requires: 64K, one disk drive, 80-column display, PC-DOS, BASICA, printer.
Sam Wilson & Associates
P.O. Box 37085
Houston, TX 77237
(713) 772-1927

**CIRCLE 769 ON READER
SERVICE CARD**

Banner, S. Wilson & Associates



New On The Market

The Desk Organizer

A program that allows users to automate and store on disk their Rolodex-type card files, alarm clock, calculator, automatic phone dialer, and appointments calendar. A gas-gauge-like indicator keeps track of the amount of storage space left on each disk, and the alarm clock feature uses chimes to alert the user to either the time or to prompt the user's memory. (List Price: \$250)

Requires: 64K, two disk drives, 80-column display. Conceptual Instruments Co. 4730 Warrington Ave. Philadelphia, PA 19143 (215) 726-7856

CIRCLE 767 ON READER SERVICE CARD

Condo Manager

A program designed to assist in managing a cooperative homeowners' association. The program combines features of a real property management system with a general ledger system tailored for homeowners' associations. The emphasis of the design is on member payments and charges and the generating of accounting reports.

Condo Manager provides the user with 14 different display screens and 12 types of management and accounting reports, including mailing labels and statements. In addition, there is provision for passing data to electronic spreadsheet programs. (List Price: \$1,400)

Requires: 96K, dual disk drives, display, printer. Coleman Business Systems 3654 Arcadian Dr. Castro Valley, CA 94546 (415) 581-7125

CIRCLE 762 ON READER SERVICE CARD

TRS to IBM-PC File Transfer Program

A program allowing transfer of data files from Radio Shack Model II, 4, 12, and Model 16 computers to the IBM PC or XT. Included with the transfer package is a communications program for the PC, as well as an adapter allowing the two systems to connect.

The file transfer program will allow files of any type or length to be transferred. File concatenation is provided, and supported baud rates range from 110 to 9,600 baud. (List Price: \$89.95)

Requires: 64K, one disk drive, async. adapter. Personal Computer Products 1400 Coleman Ave., #C-18 Santa Clara, CA 95050 (408) 988-0164

CIRCLE 761 ON READER SERVICE CARD

GraphPlan

An integrated business graphics/spreadsheet program offering built-in statistical commands, presentation graphics, and sorting and ranking capabilities.

The spreadsheet has built-in formulas, and requires only five keystrokes, for example, to add two rows of numbers. The graphics capability includes automatic generation of legends, numerical data, date, time, and logarithmic X and Y axis labels and tick marks.

Changes made in the spreadsheet portion of the program are automatically translated to graphics displays, and the user can switch between the two portions with a single keystroke.

GraphPlan prompts the user for information, and is compatible with other Chang Labs programs, such as MicroPlan. (List Price: \$395)

Requires: 128K, one double-sided disk 320K drive, MS-DOS.

Chang Labs
5300 Stevens Creed Blvd., #200
San Jose, CA 95129
(408) 246-8020
Telex: 334431 WORLDTRDS MNPK

CIRCLE 752 ON READER SERVICE CARD

The Desk Organizer, Conceptual Instruments



B. Writer

A document editing/processing program that also can instruct a user in BASIC programming techniques. Source code is included with each copy, with a compiled version also available.

B. Writer features character and line insertion and deletion, automatic line centering, automatic left or right justification of text, full cursor control, and a help screen. Available print options include underlining, bold print, compressed print, double-wide print, as well as a file include option allowing the user to chain together separate files during printing. (List Price: \$39; compiled version \$59)
Requires: 128K, two disk drives, PC-DOS, BASICA. Automated Information Systems

1503 Ave. J, #203
Lubbock, TX 79401
(806) 762-6604

CIRCLE 766 ON READER
SERVICE CARD

Statistician's MACE

A program, written in Pascal, that can aid user in analyzing data obtained from surveys and experiments. The program accepts data entered manually or from files created by the program or a text editor.

Statistician's MACE computes simple and multiple

regression estimates and correlations. Analyses of variance tests include completely randomized, factorial, blocked, split plot, repeated measure, as well as least-square designs. The program can also perform the Hodges-Lehman aligned ranks test. (List Price: \$145; documentation only \$25)
Requires: 128K, one disk drive, PC-DOS, monitor. MACE Inc.

2313 Center Ave.
Madison, WI 53704
(608) 241-4566

CIRCLE 765 ON READER
SERVICE CARD

Computer SAT

A preparatory program for the Scholastic Aptitude Test (SAT). The program is capable of diagnosing a student's strengths and weaknesses based on four pre-programmed SAT practice examinations. The program scores the practice exams, analyzes the student's performance, then prepares a study plan and guides the student through a set of study exercises.

The Computer SAT package contains a 470-page handbook, How to Prepare for the SAT, two floppy disks, and a 50-page User's Manual. (List Price: \$79.95)
Requires: 48K, one disk drive, monitor. Harcourt Brace Jovanovich
1250 Sixth Ave.
San Diego, CA 92101
(800) 543-1918
(619) 699-6335

CIRCLE 764 ON READER
SERVICE CARD



Computer SAT. Harcourt Brace Jovanovich

The Sales Manager

A program designed to manage data regarding customers, prospects, expenses, sales analysis, and personnel, for sales executives. The program stores both data files of sales (such as volumes, dates, dollar amounts, product numbers), and text files (letters, memos, notes, and contracts). The user can select and print reports on single or multiple records. The Sales Manager also keeps track of sales quotas and commissions due.

At any time during the course of a year, the program can analyze and measure current sales activity against preset plans. The system will also forecast, based on preset plans and current status, sales data for the remainder of the year.

The sales analysis portion of the program can report on activity by customer, sales volume, sales representative, branch, region, and customer type. (List Price: \$450)
Requires: 128K, one disk drive, PC-DOS, printer. Market Power
11780 Rough & Ready Rd.
Rough & Ready, CA 95975
(916) 432-1200

CIRCLE 756 ON READER
SERVICE CARD

New On The Market

Wall Street Window

A program that charts historical stock quotes from the Dow Jones News/Retrieval Service. Up to one year of daily quotes or four years of monthly quotes can be retrieved and stored on disk. The program features a data compression capability, allowing up to 112 files to be stored on a disk, each file containing up to one and one-half years of daily stock quotes.

Display graphics include Hi-Low-Close and volume, moving averages, relative strength, on balance volume, profit/loss, and comparisons between stocks and averages. Charting by daily, weekly, or monthly prices is user-selectable through interactive menus, and horizontal date units and vertical prices are automatically scaled to the display scale. The program also allows retrieved stock file to be translated into DIF format for use with financial spreadsheet programs. (List Price: \$395; demonstration disk \$75)

Requires: 128K, dual double-sided disk drives, color/graphics card, modem, password access to the Dow Jones News Service.

R&D Software Associates
Box 2727
Reston, VA 22090
(703) 476-6597

CIRCLE 753 ON READER
SERVICE CARD

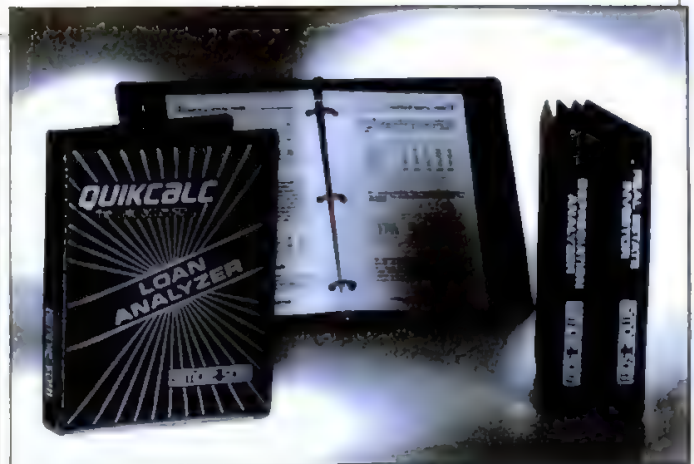
COOK-WARE

A program for the food service industry that can calculate costs of menu items, determine ingredient volumes for serving numbers, and keep track of inventory.

COOK-WARE allows the user to determine changes in the cost of a menu or recipe; print menus from memory; plan new menus with costs; determine requisites for modified diets; and print new recipes with the number of servings, quantity of ingredients, cost per serving, and preparation instructions on one report. The program includes over 250 recipes pre-programmed, which can be used or modified at will. (List Price: \$2,400; demonstration disk \$29.95)

Requires: 64K, two disk drives, monochrome monitor, matrix printer.
Computran Systems Inc.
5150 S.W. Griffith Dr.
Beaverton, OR 97005
(800) 547-4801
(503) 643-8730

CIRCLE 751 ON READER
SERVICE CARD



Quikcalc Loan Analyzer, Simple Soft

PFS:WRITE

A word processing program featuring on-screen formatting, one-keystroke "help" screens, and column, tab, and margin setting indications. A status line at the bottom of the screen indicates the document being edited, what line the cursor is on, how much memory has been used, and the function in progress.

The program integrates with PFS:FILE, PFS:REPORT, and PFS:GRAPH programs, as well as VisiCalc. (List Price: \$140)

Requires: 128K, one disk drive, PC-DOS 1.1, printer.
Software Publishing Corp.
1901 Landings Dr.
Mountain View, CA 94043
(415) 962-8910

CIRCLE 750 ON READER
SERVICE CARD

Quikcalc Loan Analyzer

A financial analysis program specifically designed for calculating costs of loans and mortgages. Calculations include amortization schedules, effective interest rates, interest paid between dates, the impact of loan charges, and the effects of an early loan termination. The program can also calculate unknown variables such as required loan amount, loan term, loan payment amounts, and balloon payments.

The program is designed to work with the VisiCalc or SuperCalc spreadsheet programs. (List Price: \$99.95)

Requires: 64K, one disk drive, VisiCalc or SuperCalc.
Simple Soft, Inc.
480 Eagle Dr. #101
Elk Grove, IL 60007
(312) 364-0752

CIRCLE 759 ON READER
SERVICE CARD

MS-1 and MS-2 Mouse Support Programs

Two programs to support the use of a mouse with the user's system. MS-1 is a basic control utility allowing the use of a mouse with any PC compatible software package without modifications. Mouse motion and button clicks are automatically translated into user-definable key code sequences.

MouseWindow (MS-2) is a more advanced software development program consisting of object modules for mouse tracking, line drawing, and "RasterOp" operations. The routines are written in assembly language and are optimized for high speed. High resolution graphics are supported on the Hercules Graphics Card and the I.B.M. Color Card. (List Price: MS-1 \$20; MS-2 \$40)

Requires: MS-1: 64K, PC-DOS, mouse; MS-2: 128K, mouse, color/graphics card. Mouse Systems Corp.
2336 H Walsh Ave.
Santa Clara, CA 95051
(408) 988-0211
Telex: 467848

**CIRCLE 749 ON READER
SERVICE CARD**

SmarTerm/PC TE400- FT

A terminal emulator program allowing a user's system to operate as a Data General D100, D200, or D400 terminal. The program allows data transfer at rates up to 9,600 baud.

SmarTerm TE400-FT implements virtually all of the features of the Data General terminals, including multiple windows with independent scrolling and window erase, character display attributes such as underline, blink, dim, reverse video, and protected, and local printer support including

"pass-through" mode. The program also offers the ability to transmit and receive text and binary files using an "error-free" protocol over telephone lines. (List Price: \$125)

Requires: 96K, two disk drives, PC-DOS, monitor, async communications adapter.

Persoft, Inc.
2740 Ski Ln.
Madison, WI 53713
(608) 233-1000

**CIRCLE 746 ON READER
SERVICE CARD**

CITATION

A 3.0 version of the CITATION electronics filing program, featuring improved formats, an interactive search capability, reduced RAM requirements, and the use of data compression techniques for more efficient disk utilization.

The program stores, retrieves, and cross-references data in three formats: journal/periodical citations, book references, and notes related to companies or persons. A keyword index is automatically maintained, supporting access to all items by subject.

The new version of CITATION also permits the user to observe the success of a database search while it is in progress. The search, based on a list of keywords, can be interrupted and restarted at any time, and the user can vary the degree of matching between the keyword list and the database items during the search. (List Price: \$185; manual alone \$25; demonstration disk \$35)

Requires: 96K, two disk drives or hard disk, PC-DOS, monitor, printer. Eagle Enterprises
2375 Bush St.
San Francisco, CA 94115
(415) 346-1249

**CIRCLE 756 ON READER
SERVICE CARD**

Citation, Eagle Enterprises



New On The Market

Professor DOS

An instructional training program that guides novice users through fundamental PC-DOS concepts, commands and editing functions. The interactive portion of the program provides approximately 4 hours of hands-on instruction.

Lessons are segmented, and the user is given a choice as to whether to proceed step by step through the course material or speed up/slow down the learning pace. (List Price: \$59.95)

Requires: 64K, one disk drive, PC-DOS, monitor. Individual Software, Inc. 24 Spinnaker Pl. Redwood City, CA 94065 (415) 591-4166

CIRCLE 755 ON READER SERVICE CARD

Order Entry/Inventory Control & Analysis. IUS



Order Entry and Inventory Control & Analysis Programs

Two business programs compatible with the Easy-Business Systems software series, and each other. Order Entry generates order confirmations; calculates prices, discounts, and taxes; maintains back-order status; and prints packing slips, invoices, and reports. Forms can be custom-designed using the program's built-in text editor.

Inventory Control and Analysis provides the user with inventory status analysis, out-of-stock reports, current inventory valuations, and gross margin analyses.

Both programs are accompanied by instructional disks, and the software prompts the user for information. (List Price: \$595 each)

Requires: 64K, one disk drive, PC-DOS 1.1. Information Unlimited Software, Inc. 2401 Marinship Way Sausalito, CA 94965 (415) 331-6700

CIRCLE 757 ON READER SERVICE CARD

Cdex Training for the EasyWriter II

An interactive personal training program for the EasyWriter II word processing program. The course, in three disks and an indexed reference guide, introduces users to key concepts and terms, use of commands, and the printing of documents. (List Price: \$69.95)

Requires: EasyWriter II. Cdex Corp. 5050 El Camino Real, #200 Los Altos, CA 94022 (415) 964-7600

CIRCLE 748 ON READER SERVICE CARD

Notebook

A database management system specifically designed for storing and retrieving text. The program can select and sort on any text in any field, without need of key words to search for records. Selected records can be displayed, saved on disk or printed. Report formats can be edited with a built-in report editor.

Notebook includes a full-screen editor with WordStar-type commands. The data is compatible with other databases and text editors, including dBase II and WordStar. (List Price: \$150)

Requires: 128K, two disk drives, PC-DOS or CP/M-86, monitor. Digital Marketing Corp. 2363 Boulevard Cir. Walnut Creek, CA 94595 (415) 947-1000

CIRCLE 754 ON READER SERVICE CARD

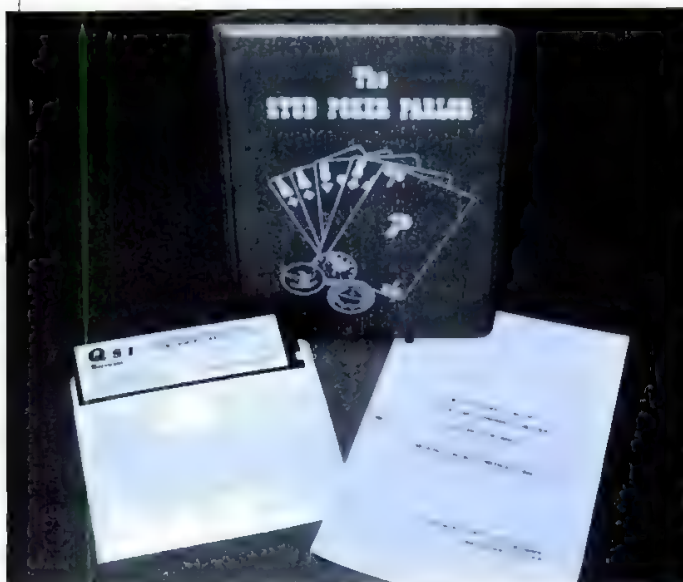
LetterBANK/Courier I

A business correspondence applications program containing 200 pre-formatted letters dealing with the common correspondence needs of small businesses. Letters include sales promotions, personnel, past-due account collections, as well as in-house memos on subjects such as housekeeping and telephone procedures. On the average, there are three versions of each letter, and any letter can be modified by using a word processing program or text editor.

LetterBANK includes its own merge print program, Courier I, which allows users the option of sending their letters directly to a printer and bypassing their own merge program. (List Price: \$99)

Requires: 48K, two disk drives, PC-DOS or CP/M-86, printer. The Wyndham Group, Ltd. 125 Mirona Rd. Portsmouth, NH 03801 (800) 972-5600 (603) 431-4800

CIRCLE 743 ON READER SERVICE CARD



The Stud Poker Parlor, QSI Software

The Stud Poker Parlor

A game program in which the player is pitted against the computer in games of five or seven hand stud poker. Player options include the size of the bankrolls and pot, the ante, and one of three play levels (conservative, normal, or aggressive).

The program is designed to behave as a human player, including bluffing, concealment, and learning from experience. (List Price: \$29.95)

Requires: 64K, one disk drive, PC-DOS, monochrome or color monitor.

QSI Software
P.O. Box 3-231 ECB
Anchorage, AK 99501
(907) 349-1189

CIRCLE 740 ON READER
SERVICE CARD

Micro Link II

A communications and electronics mail program that can send and receive text, data, or program files up to the capacity of the user's disk drive. Several file-sending methods are available, including prompted line-by-line transmission and error-checked sector transfer.

The Micro Link II program is customized for each user's system at time of purchase. (List Price: \$89)

Requires: 64K, one disk drive, MS-DOS or CP/M-86, serial port, modem.

Digital Marketing
2363 Boulevard Cir.
Walnut Creek, CA 94595
(415) 947-1000
Telex: 17 1852 DIGMKTG
WNCK

CIRCLE 742 ON READER
SERVICE CARD

PC-REGISTER

A menu-driven program integrating inventory control, point-of-sales order processing, customer accounts receivables, and vendor management. PC-REGISTER converts the user's system into a cash register, and is password-protected.

The user has the ability to control pricing, discounts, C.O.D. charges, shipping and handling charges, and to apply credits to a customer's account automatically. Reports generated by the program include Customer Statements, Inventory Price Lists and Reorder Reports, Mailing Labels, as well as financial data reports. Up to 20,000 inventory items, 1,000 customer accounts, and 1,000 vendors can be supported by the program. (List Price: \$495)

Requires: 128K, one floppy and one hard disk, PC-DOS.

Informative Software
33 Andover Ln.

Hicksville, NY 11801

(516) 822-2377

(516) 467-1801

CIRCLE 710 ON READER
SERVICE CARD

Micromarkets II

A database program for use by sales researchers and sales managers. Micromarkets II is designed to work with VisiCalc-type spreadsheet programs, and is pre-programmed with data from the 1980 Census and from the 1983 estimates of Market Statistics, Procedures of the Survey of Buying Power.

The program contains 34 demographic and retail sales variables for each state and for each of the 50 largest metropolitan areas. Twelve variables are provided for each of the 200 largest metropolitan areas.

Users manipulate the data using VisiCalc or other spreadsheet programs to custom-tailor trading areas and indices of market potential. By adding their own company's sales data, users can compute their market share in different regions of the country. Micromarkets II stores the data in DIF format. (List Price: \$99)

Requires: 48K, one disk drive, PC-DOS, monitor, printer, DIF-compatible programs.

Orrington Economics, Inc.
P.O. Box 3756
Arlington, VA 22203
(703) 527-5990

CIRCLE 739 ON READER
SERVICE CARD

New On The Market

Individual Tax Program

A program to help the user prepare the 1983 tax forms. Four print formats are provided—computer-generated, pre-printed continuous forms, overlay transparencies, plus the ability to provide individual forms for a single client.

The program is written in a CP/M-86 Cobol format, and presents the user with an easily-understood screen. Each field is numbered and explanations for each field number appear at the bottom of the screen. Error trapping of key items prevents the user from moving to a new screen until all needed information has been entered. Forms and schedules are automatically called up by the program as a result of entered data.

Features include the calculation of the marriage deduction, selection of the lowest tax alternative, and depreciation computed using the Accelerated Cost Recovery System, which carries over to the correct one of five available schedules C and F and to Form 3468 for Investment Credit.

The Individual Tax Program is accompanied by documentation including sample forms showing the field numbers assigned. Input sheets are also provided, as is a copy of the 1982 tax preparation program to facilitate learning, and a Cobol run-time module.

Annual updates of the program are available to purchasers at one-third of the original cost. (List Price: \$1,995)

Requires: 128K, two disk drives, CP/M-86, monochrome monitor, 80-column printer.

University Software, Inc.
1061 Fraternity Circle Dr.
Kent, OH 44240
(216) 678-4559

CIRCLE 741 ON READER
SERVICE CARD

OS Converter

A conversion program allowing the user to run programs written for either the PC-DOS (MS-DOS) or CP/M-86 operating systems on the same system. OS Converter operates by loading a target program into memory and creating the environment to run the target program.

There is no need to interpret instructions; OS Converter remains in control of operations.

The program is 4K bytes in size, and resides just above the resident operating system in RAM. Use of the conversion system involves no loss of processing speed. (List Price: \$95)

Requires: 64K, two disk drives, PC-DOS or CP/M-86. Dynamic Microprocessor Associates, Inc.
545 Fifth Ave.
New York, NY 10017
(212) 687-7115

CIRCLE 747 ON READER
SERVICE CARD

Dental Office Management PC

A database management program for dental practices. The program includes an accounts receivable system for private patient billing, an insurance claims management system for the preparation and collection of American Dental Association standard claims and pre-authorizations, and an appointment management system with patient reminder recall.

Dental Office Management PC can prepare bills, forms, attending dentists' statements, account reviews, daily journals, monthly aged accounts receivable reports, and practice productivity reports. (List Price: \$859.95)

Requires: 128K, two disk drives, PC-DOS 1.1, 132-column printer.

CMA, Micro Computer Div.
55722 Santa Fe Trail
Yucca Valley, Ca 92284
(619) 365-9718

CIRCLE 709 ON READER
SERVICE CARD

Chartman IV

A business graphics program that can produce specialized scatter graphs and GANTT charts, line charts, and a statistical curve-fitting feature. The program features a fill-in-the-form approach to graphics creation, and is designed to lead the user through the creation process using conversational English, with command instructions corresponding to the keyboard.

Graphics created with Chartman IV can be printed with the Epson MX80/MX100 printers with Graftrax, or plotted using IBM or Hewlett-Packard plotters. The program also displays in color on RGB monitors.

The program is accompanied by a user's manual with a glossary of frequently used computing and graphics terms. (List Price: \$300; with Chartman II \$500)

Requires: 128K, one disk drive, PC-DOS, color monitor, graphics card.

Graphic Software Inc.
1972 Massachusetts Ave.
Cambridge, MA 02140
(617) 491-2434

CIRCLE 705 ON READER
SERVICE CARD

SuperStar

A color support and default-parameter customizing program for use with WordStar. SuperStar allows the user to select the foreground and background colors for WordStar, eliminating the white-on-black format that WordStar defaults to when used with a color monitor. Reverse video is supported for monochrome monitors.

The program also allows the user to select default parameters for WordStar from a menu. Once selected, WordStar will continue to use the custom parameters, eliminating the need to reset each time the word processing program is booted. (List Price: \$29.95)

Requires: 128K, one disk drive, PC-DOS, 80-column monitor, WordStar.
Relational Solutions, Inc.
8723 Woodleigh Dr.
Houston, TX 77083
(713) 530-4161

CIRCLE 708 ON READER
SERVICE CARD

Personal Computer/ Fixed Asset System (PC/FAS)

A program allowing users to keep complete and accurate records of owned and leased property and equipment, for the I.R.S. and state and local governments, insurance companies, and business auditors.

PC/FAS can calculate depreciation and investment tax credits to which the user may be entitled under ERTA, TEFRA, and other tax laws, and can print an I.R.S. Depreciation Form 4562 from data stored. The user may choose to use the depreciation methods already programmed, or override the methods in favor of user-defined formulas. PC/FAS also allows for two sets of depreciation records to be maintained simultaneously, one for the I.R.S. and one for equity statements.

With a fixed drive, 65,000 assets can be stored on one interactive file, or 50,000 each on two fixed drives. With a 320K disk drive, 1,400 assets can be stored on each disk, up to a maximum of 99,000 items. (List Price: \$395)

Requires: 64K, one disk drive, PC-DOS, 80-column monitor, printer.

Best Programs
P.O. Box 2370
Alexandria, VA 22301
(703) 549-3663

CIRCLE 711 ON READER
SERVICE CARD



Personal Computer/Fixed Asset System, Best Programs

AMI Restaurant Accounting System

An accounting package designed specifically for restaurant management. The package includes Inventory Control, General Ledger, Accounts Receivable and Payable, and Payroll.

Features include daily purchases journal and average cost variance report, daily requisitions register, requisition recap by item and department, over and short comparison reports, month-to-date cost distribution, item cost, item usage analysis, and item class.

The Restaurant Payroll included in the package takes into account tip re-

porting, and FUTA and SUTA reporting requirements. The program can print W-2 forms, 941As, and QTD/YTD Earnings Reports. (List price: \$2,495)

Requires: 64K, two disk drives, PC-DOS 2.0, monitor.

Automation Management Inc.

5718 Westheimer, #410
Houston, TX 77057
(713) 781-5941

CIRCLE 704 ON READER
SERVICE CARD

New On The Market

Office Filer

A database management system that teams the user's system function and cursor control keys to create forms in a fill-in-the-blank format. Files compiled from the forms may be password-protected. Office Filer supports arithmetic and logical expressions or a combination of both. (List Price: \$395)

Requires: 128K, one disk drive, MS-DOS.

Digital Marketing Corp.
2670 Cherry Ln.
Walnut Creek, CA 94596
(415) 938-2880

Telex: 17 1852 DIGMTG
WNCK

CIRCLE 702 ON READER
SERVICE CARD

GrafTalk

A graphics program that uses English commands to produce bar, pie, line, and symbol charts. Diagrams can be preformatted, with variable data added periodically to produce regular reports.

The program features light pen and joystick control support, and can mix different types of graphics on a single chart. GrafTalk conforms to the GSX graphics standard. (List Price: \$450)

Requires: 128K, one double-sided disk drive, PC-DOS 1.1, color monitor, graphics adapter card.

Redding Group, Inc.
609 Main St.
Ridgefield, CT 06877
(203) 431-4661
Telex: 64 3351

CIRCLE 706 ON READER
SERVICE CARD

ACOM-300

A communications program designed to allow users to link their systems to General Electric Information Services Company's (GEISCO) Mark III remote computing network. ASCII files can be received and sent using simple screens, and on-line printer support is provided. A local mode permits user directory listing, individual disk file viewing, and disk file deletion while remaining connected to GEISCO's Mark III network. ACOM-300 is furnished on a single-sided disk with documentation booklet. (List Price: \$49.95)

Requires: 64K, one disk drive, PC-DOS 1.1, an async adapter, 80-column display, 300-baud modem, BASICA 1.1.

Allston Group
P.O. Box 1557
Richardson, TX 75080
(214) 235-1631

CIRCLE 707 ON READER
SERVICE CARD

HALO

A graphics program encompassing pre-programmed subroutines to create bar charts, graphics, text with a variety of fonts and sizes, and specially designed shapes and textures.

The program's use of world coordinates allows the user to create graphics on one type of system, then later display the results on another system without modification. Graphics can be stored in memory for on-screen presentations, or reproduced in full color on paper, transparencies, or 35mm slides, using a range of compatible monitors, printers, and cameras.

HALO is available to run under BASIC, Pascal, "C", Assembler, and Fortran. Routines are included which are capable of converting common dot matrix printers into a 960 x 720 plotter, and the program can support the concurrent use of light pens, digitizing tablets, and digital mice. (List Price: \$150)

Requires: 64K, one disk drive, MS-DOS, color/graphics adapter, or monochrome graphics board, monitor, printer or plotter.

Media Cybernetics, Inc.
36 Columbia Ave.
Tacoma Park, MD 20912
(301) 270-2272

CIRCLE 701 ON READER
SERVICE CARD

JETDRIVE DOS 2.0

A program that uses the extra RAM within a user's system as a pseudo-disk drive. The program works with any RAM boards to create a storage facility of up to 512K, or up to 2.5 megabytes when used in conjunction with Tall Tree's 512K JRAM boards.

The program allows software control of the amount of RAM to be allocated to system and electronic disk, eliminating the need for the user to reset DIP switches inside unit. JETDRIVE can also restore data on the electronic drive after Ctrl-Alt-Del, in case of program hang up. Included with JETDRIVE is JET, a transfer program capable of copying files to and from disk drives, RAM drive, or hard disks, several times faster than the copy utility supplied with DOS.

JETDRIVE will transfer data to and from disks in any of 19 formats. (List Price: \$40)

Requires: 128K, PC-DOS 2.0, at least one RAM board.
Tall Tree Systems
1036 Los Altos Ave.
Los Altos, CA 94022
(415) 941-8748

CIRCLE 705 ON READER
SERVICE CARD

Long Distance Analyzer

A menu-driven program for maintaining track of long distance phone call costs. The program organizes and analyzes phone call expenses, identifies parties called, and can produce totals and costs by which the user may evaluate services such as WATS. In addition, *Long Distance Analyzer* allows the user to recover phone company billing errors, print an alphabetical directory, and account for costs by category. (List Price: \$195)

Requires: 64K, one disk drive, PC-DOS.

Golden Braid Software
1450 Ranchero Dr.
Sarasota, FL 33582
(813) 371-0388

CIRCLE 706 ON READER
SERVICE CARD

SBB Pascal Compiler

A two-pass, locally optimizing Pascal compiler that closely follows the Jensen & Wirth definition of the language, with extensions designed to aid the professional programmer in software development. The compiler includes an interactive Pascal debugger, designed to aid in isolating and correcting faults in Pascal programs. Features of the debugger include the abilities to set and display both absolute and conditional breakpoints; set watches on variables, procedures, or func-

tions; display and modify both global and local variables; display the procedure/function stack, current statement and module numbers, current run-time requirements, and the last ten statements executed; and the ability to trace through a program by statement number and procedure/function entry/exit.

Also included with the compiler is a screen editor, capable of insertion and deletion of lines and characters, finding and/or replacing of strings, copying lines of text, and autoindent for entering structured programs. The editor makes use of functions keys, and is provided in source as an example of the advantages of programming in SBB Pascal. (List Price: \$295)

Requires: 128K, two disk drives, PC-DOS 1.1, 80-column monitor.

Software Building Blocks, Inc.

P. O. Box 119
Ithaca, NY 14851
(607) 272-2807

CIRCLE 498 ON READER
SERVICE CARD

Charitable Organization Receipting System (CORS)

A program designed to record and store information on funds received by charitable groups such as churches, service clubs, etc. Income includes business donations, grants, fees, sales of goods or services, or cash collections. Income targets or designations are used to determine what the funds are to be used for (general fund, building fund, etc.). Up to 40 designations may be defined.

Income by source, by designation or both is summarized and reported by the program, and income tax receipts and mailing labels can also be produced. CORS allows up to 900 member sources, 40 income type descriptions, and 40 designations. Transaction volume is based on disk capacities. (List Price: \$550 U.S.; \$695 Canadian)

Requires: 64K, two 320K disk drives, PC-DOS, 132-column printer.

Prairie Data Systems, Inc.
#202-626 Broadway Ave.
Saskatoon, Saskatchewan
S7N 1A9, Canada
(306) 384-7110

CIRCLE 499 ON READER
SERVICE CARD

Personal COBOL

An integrated applications software development program that includes the programming capabilities of two other programs, *VISUAL PROGRAMMING* and *LEVEL II COBOL* software. It allows a user to interactively create, analyze, debug, and modify mainframe-level COBOL programs. *PERSONAL COBOL* includes full screen editing, forms generating, and program animating functions. The program interprets the source code in a manner similar to BASIC.

On a color monitor, the debugging portion of the program highlights the various sections of the program being written in different colors, aiding the user in locating possible bugs. The user can control the speed of the program review process, stop the program being reviewed, examine and modify data, modify the source code, and continue the execution. (List Price: \$400)

Requires: 128K, two disk drives or hard disk, PC-DOS 1.1; color capabilities require color monitor and adapter card.

Micro Focus Inc.
1860 Embarcadero Rd.
#235
Palo Alto, CA 94303
(415) 856-4161

CIRCLE 708 ON READER
SERVICE CARD

New On The Market

Wealth Watcher's Personal Financial Management

A financial data management program. Up to 120 rows of data may be entered, with 13 pre-defined—January through December, and Year-to-Date. Row items are accessed by a user-defined 10-character key consisting of a 4-character prime code, 4-character sub code, and a 2-character detail code. In addition, a 3-character sequence code allows row items to be grouped to allow sub totals on reports.

The program includes a sort routine which sorts records by sequence code and key. A 3-character I.D. allows the user to maintain separate sets of files for each financial entity, such as subsidiaries. In addition, the program recognizes three types of files for each entity—Plan, Actual, and Expected. Plan is used to enter a budget for a year; Actual is used to enter data monthly; and Expected is used for making year-end revisions to the budget and can be automatically updated with year-to-date Actual to compare estimates.

The program can print 12 period worksheets, and can print in compressed type. (List Price: \$49)

Requires: 64K, two disk drives, PC-DOS, monitor, printer.

Personal Software Co.
P.O. Box 776
Salt Lake City, UT 84110
(801) 277-3174

CIRCLE 704 ON READER
SERVICE CARD

QUILL

A text formatting program compatible with text editor programs such as WordStar and EasyWriter. The program features automatic Table of Contents and Bibliography generation, automatic pagination and paragraphing, multiple type fonts, and supports the capabilities of printers such as Epson, C.Itoh, and Okidata.

Additionally, QUILL allows multi-file processing, allowing the user to break documents down into chapter-sized files for editing, then chaining the files together for printing as a single document. (List Price: \$249)

Requires: 128K, one disk drive, PC-DOS or CP/M-86, text editor program, printer.

Sextant Systems
P.O. Box 251
Holmdel, NJ 07733
(201) 671-7670

CIRCLE 703 ON READER
SERVICE CARD

Release 1A of 1-2-3

A new version of 1-2-3 that allows the popular spreadsheet program to support a larger array of computers and a range of devices such as graphics printers, including the Epson FX-80, MX-80, and MX-100 with Graftax, the Okidata Microline series, the Prism Printers, and the IBM Graphics Printer. The program also supports the Hewlett-Packard HP7470A plotter.

The new version is also compatible with the PC-XT, allowing the program to take advantage of the XT's extended hard disk capabilities and PC-DOS 2.0. (List Price: \$495)

Requires: 128K, one disk drive, PC-DOS.

Lotus Development Corporation
55 Wheeler Street
Cambridge, MA 02138
(617) 492-7171

CIRCLE 700 ON READER
SERVICE CARD

ACCESSORIES

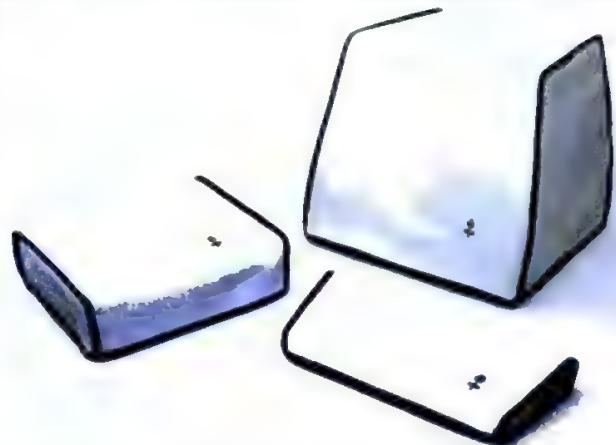
ComputerWear Dustcovers

A line of canvas-weave cotton dustcovers with soft inner lining, designed to fit the individual components of a user's system. Design features include an embroidered rose emblem and woven binding. (List Price: Keyboard \$18; Drive \$18; Monitor \$18; Printer \$18; Monitor on Drive \$36)

Contemporary ComputerWear
1320 36th Ave.
San Francisco, CA 94122
(415) 564-0506

CIRCLE 706 ON READER
SERVICE CARD

ComputerWear Dustcovers, Contemporary ComputerWear





Rainbow Box Colored Disks,
CentTech Technology

Rainbow Box Colored Disks

Single-sided, double-density disks in five colors to aid in filing and classification. Each Rainbow Box contains ten disks in five colors: red, orange, yellow, green, and blue. Other color combinations are available as special orders. Disks are made of heat-resistant Homopolymer PVC. (List Price: soft box \$34.95; plastic case \$37.95) CentTech Technology Inc. 183 Cottage Ave. Sandy, UT 84070 (801) 261-1600

CIRCLE 732 ON READER
SERVICE CARD

No Zap

A device to eliminate static electrical charges from users' hands prior to touching keyboards. The device is placed near the keyboard; prior to using the board, the user touches the metal point on No Zap. Static charges are passed to ground through the device's lead and alligator clip. (List Price: \$12.95) KIS Engineering 10C College Ln. Methuen, MA 01844

CIRCLE 734 ON READER
SERVICE CARD

Continuous Envelopes

A line of custom pre-printed continuous envelopes which can be used in any printer accepting a 12-inch wide form. The envelopes can be ordered blank, or with three lines of print in black ink in the upper left corner, in quantities of 200, 500, or 1,000. Additional lines or non-standard type fonts, other colors, or special imprints are available at extra cost. Envelopes are made of 24-lb. white bond stock, and are folded two-up with pocket glued on three sides. (List Price: 200-\$16; 500-\$42.50; 1,000-\$69, unprinted) Micro Format 1271 W. Dundee Buffalo Grove, IL 60090 (312) 537-2426

CIRCLE 733 ON READER
SERVICE CARD

The AB Series Travel and Storage Cases

A line of aluminum bound, hardwood cases with splash-proof seals intended to serve as reuseable shipping and storage cases for precision instruments. The cases are resistant to water, corrosion, and dust, and are made of ½-inch birch plywood with a clear varathane finish and aluminum binding along edges and corners. The splash-proof seal at the parting line is made of extruded aluminum with Neoprene sponge inset. Catches, corners, and handles are zinc plated steel.

There are seven styles available. Colors available include white, navy grey, safety yellow, blue, or any standard varathane color.

Custom-fitted, close tolerance poly foam inserts are available from the manufacturer. (List Price: \$85 to \$500, depending on size and model) Schry-Way Cases One West Mountain Pasadena, CA 91103 (213) 796-5491

CIRCLE 712 ON READER
SERVICE CARD



AB Series Travel & Storage Cases, Schry-Way

New On The Market

The Information Station

A computer desk featuring tubular steel construction and laminated work surface. Desk height is 27¼-inches, width is 41½-inches, and depth 26-inches.

A pair of optional drawers can be attached to the desk. (List Price: \$255; optional drawers \$65 pair) Presentation Systems, Inc. 455 Powell St. San Francisco, CA 94102 (415) 956-8399

CIRCLE 737 ON READER SERVICE CARD



Trunk Disk Storage Units, Leading Edge

SS-I Systems Stand

A stand for the IBM-PC systems unit or expansion chassis that allows the unit to rest safely on its end, reducing the amount of desk space taken up by the unit.

The SS-I Systems Stand matches the IBM-PC in color and styling, and places the systems' on/off switch on top for convenience. (List Price: \$24.95) Curtis Manufacturing Co., Inc. 20 Grove St. Peterborough, NH 03458 (603) 924-7803

CIRCLE 729 ON READER SERVICE CARD

Trunk Disk Storage Units

A line of four lightweight plastic disk and cassette/cassette storage units with carrying handles. Each of the four units are designed for a specific software format.

The units designed for 5¼-inch and 8-inch disks can hold up to 60 disks each. (List Price: Game cartridge unit and game/cassette unit \$29.95 each; 5¼- and 8-inch disk units \$39.95)

Leading Edge Products, Inc. 225 Turnpike St. Canton, MA 02021 (800) 343-6833 (617) 828-8150 Telex: 95 1624

CIRCLE 730 ON READER SERVICE CARD



SS-1 Systems Stand, Curtis Manufacturing

VOAD Keyboard Phone

An auto-dialing device that links to the user's system through the RS-232 port and is equipped with a standard RJ-11 jack for hookup to a handset, headset, or speaker phone. The device allows for high-speed dialing of an unlimited number of telephone numbers, call recording, and access to telephone lines through computer memory.

The Keyboard Phone draws power from the telephone line and does not require additional power sources. It automatically selects touchtone or pulse mode and offers redial capabilities. The unit can be mounted beneath work surfaces with adhesive strips. (List Price: \$199.50)

VOAD Systems 8570 Wilshire Blvd., #227 Beverly Hills, CA 90211 (213) 550-0629

CIRCLE 735 ON READER SERVICE CARD

Diskaddy

A portable filing and storage case for 5¼- and 8-inch disks. Up to 22 disks can be held upright and flat in accordian pockets. Each pocket holds two disks and has two indexes for filing. The case's closing flap has an index tab visible on top, and the case contains an inner pocket for disk directories. (List Price: \$5.99)

Fourdee Products Co.
8950 Villa La Jolla Dr.
#1200
La Jolla, CA 92037
(619) 455-7493

CIRCLE 738 ON READER
SERVICE CARD



Diskaddy, Fourdee Products

FlipTrack Instruction Courses

Six audio cassette training courses featuring the patented FlipTrack cassette format. The FlipTrack feature allows the learner to flip over the cassette at key points in the lesson to adjust to equipment differences or to tackle optional topics of specialized interest. Instructions in the accompanying Operator's Guide return the learner to his previous position on the front side of the tape to continue the lesson. The format works on standard audio cassette players without requiring a computer hook-up.

The six new "how to" courses apply to the IBM Personal Computer, the Ap-

ple IIe and III, the CP/M Operating System, VisiCalc, and WordStar. Each course typically consists of three or four cassettes, some with program disks, accompanied by an indexed Operator's Guide. (List Price: \$49.95 to \$95)

FlipTrack Learning Systems
526 Main St. Box 711
Glen Ellyn, IL 60137
(312) 790-1117

CIRCLE 731 ON READER
SERVICE CARD

MICROREF

A reference guide for WordStar printed on durable, non-glare plastic sheets. MICROREF offers users key procedures, illustrations, notes, a glossary of important terms, an index, and a summary of all commands on two double-page spreads. (List Price: \$19.95)

Requires: WordStar.
Educational Systems, Inc.
1000 Skokie Boulevard
Wilmette, IL 60091
(312) 256-4750

CIRCLE 713 ON READER
SERVICE CARD

PUBLICATIONS

Catalog of Public Domain Software

A series of catalogs of program disks in the public domain. Each volume contains the table of contents and abstracts of programs available. The public domain libraries from which disks can be obtained include The PC/Blue and SIG/M group libraries.

Each book contains over 200 pages, and lists languages, applications programs, utilities, and games, available either free or for nominal copying charges. (List Price: \$10 per catalog U.S.; \$15 overseas)
New York Amateur Computer Club Inc.
P.O. Box 106
Church Street Station
New York, NY 10008
(212) 243-0325

CIRCLE 725 ON READER
SERVICE CARD

FlipTrack Instruction Courses,
FlipTrack Learning Systems



New On The Market

Simplified Guide to Small Computers for Business

An introduction to small business computers, focusing on information a prospective microcomputer buyer requires prior to purchase. This book, by author Daniel McGlynn, covers a range of topics, from the capabilities and limitations of hardware, software, and peripheral devices, to applications in finance, accounting, and marketing. Chapters provide guidelines for computer product evaluation, including outlines and checklists of system features.

The guidebook also provides sample screen displays and printouts of typical applications programs, a feasibility analysis of factors to be considered prior to purchasing a small computer, and a description of the leading small business systems currently available.

(Paperback, \$14.95)
John Wiley & Sons, Inc.
605 Fifth Ave.
New York, NY 10158
(212) 850-6000

CIRCLE 728 ON READER
SERVICE CARD

Xpressions

A newsletter for VisiCalc users, featuring financial templates that readers can key into their own systems. The templates cover a variety of financial applications, such as Amortization, Budgeting, Cash Flow, Interest Calculations, Personal Finance, and Statistics. Other features of the monthly publication include Tips and Techniques, Announcements of Interest, and a Reader Bulletin Board. (Subscription Price: \$48)
Scope Publications, Inc.
P.O. Box 1252
Maitland, FL 32751
(305) 645-2351

CIRCLE 731 ON READER
SERVICE CARD

PLUMB

A newsletter specializing in information on services available to a microcomputer user with a modem and telephone. Regular features include reporting on new database systems, and expansions in existing systems such as Source and CompuServe. The newsletter covers an array of private and company-sponsored databases and systems, as well as "underground" bulletin boards and user-nets.

PLUMB also features these other services: Electronic mail, software sales and exchanges, dating services and adult bulletin boards, financial and investment information, merchandise sales, and online

games. (\$20 for five issues)
Riverside Data Inc.
P.O. Box 300
Harrods Creek, KY 40027
(502) 228-3820
CompuServe: 72715,210

CIRCLE 727 ON READER
SERVICE CARD

PC Clearinghouse Software Directory

A buyer's guide listing more than 21,000 software packages available for microcomputers. The guide also lists 2,912 software publishers, and 200 microcomputer manufacturers, with cross-references to hardware, operating systems, applications programs, languages, and prices.

Besides names and addresses of software and hardware vendors and manufacturers, the directory also lists applications programs available for specific needs, which software programs can be used with certain hardware, and what operating systems run on specific microcomputers. (List Price: \$29.95, 850 pgs.)
PC Clearinghouse, Inc.
11781 Lee Jackson Hwy.
Fairfax, VA 22033
(800) 368-4422

CIRCLE 726 ON READER
SERVICE CARD

Introducing the UNIX System

A primer for the novice UNIX user, this book by Henry McGilton and Rachel Morgan covers in detail the UNIX operating system developed by Bell Laboratories. Focussing on version 7 of the system, plus the modifications developed at the University of California at Berkeley, the book demonstrates how to log on, explains the directory structure and file system, and describes UNIX utility packages available such as text editors, document formatters, and electronic mail utilities. It includes a detailed discussion of shells, which allow users to define their own commands.

Intended as a supplement to existing UNIX system documentation, the book examines such topics as commands and standard files, software development tools, and user-to-user communications. (Paperback, 556 pgs., \$18.95)
McGraw-Hill Book Co.
Professional & General Books
1221 Avenue of the Americas
New York, NY 10020
(212) 997-3493

CIRCLE 714 ON READER
SERVICE CARD

TOTAL RECALL™

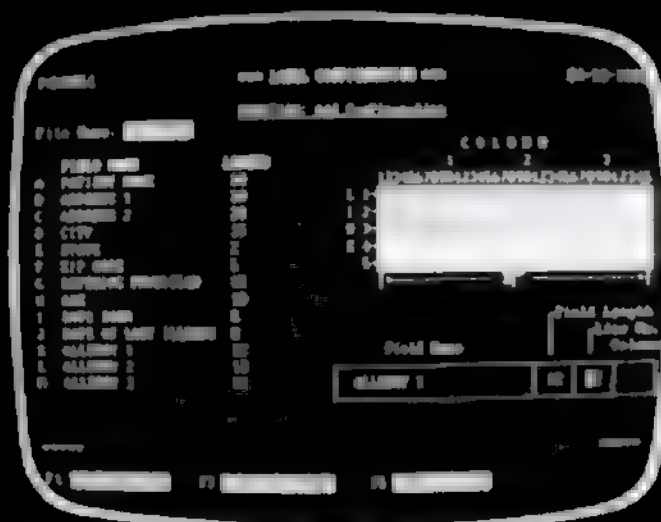
THE DATA BASE FOR SOPHISTICATED LIST MANAGEMENT APPLICATIONS

TOTAL RECALL - power and sophistication in list management for both the novice user (everything's in 'English') and the computer whiz (extremely flexible).

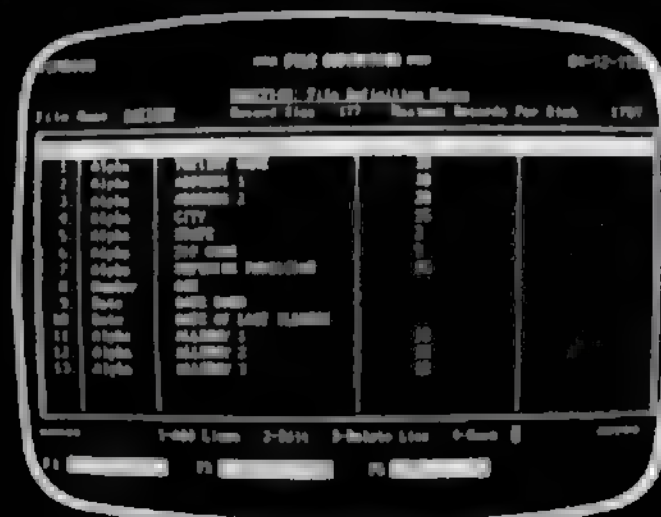
Simple to understand, fast to learn, and exceptionally easy to use.

You can have this fast and highly efficient program running in less than one hour.

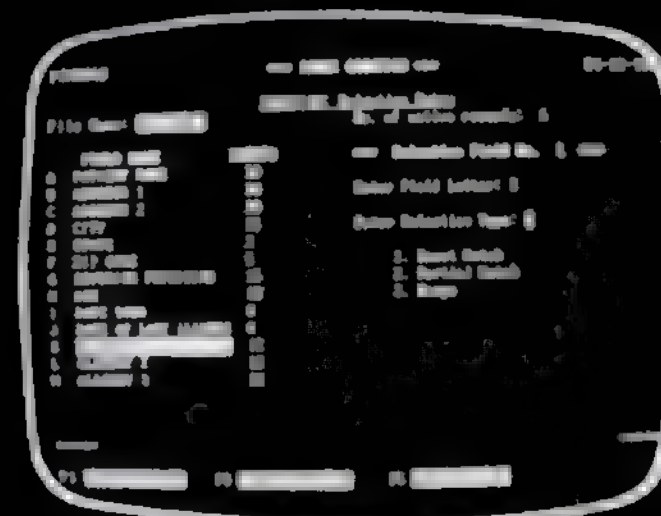
- For customer lists, patient lists, keeping track of prospects (last time called, number of children, etc.), organizing mailing lists to take advantage of Post Office discounts, and many other uses.
- Easy to Understand and Use - IBM® style manual filled with examples and complete 'English' language instructions.
- Complete 'For the Novice' Tutorial.
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- Conversion facility for your existing files.
- DOS 1.1 and 2.0 compatible. Uses standard DOS files. Up to 100,000 records per file using DOS 2.0.
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The SOFTA Group, Inc.
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Northfield, IL 60093
312/446-SOFT
CIRCLE 360 ON READER SERVICE CARD

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Sysgen ImageTM Fast streaming backup for IBM's XT: **\$995.** (Right. Nine hundred ninety-five dollars!)

Sysgen is delivering complete low-cost Winchester systems with high-speed tape cassette backup.

Low cost means that everyone can afford to keep their valuable data safe and movable.

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Our hard disk systems operate under PC-DOSTM or CP/M-86TM.

Under PC-DOS, they look like disk drives C: through L: Under CP/M-86, you get fourteen new "disk drives."

And if you own an IBM XT, which includes a hard disk, you can get safe, fast backup with our new Image streaming tape cassette backup system for only \$995.

Look to Sysgen for fast, inexpensive backup. With or without hard disk.

For complete information, see the smartest computer store in your neck of the woods. Sysgen, Inc., 47853 Warm Springs Road, Fremont, CA 94539. (415) 490-6770.

SYSGEN
• INCORPORATED •

CIRCLE 472 ON READER SERVICE CARD

EDITED BY BILL MACHRONE

PC readers help each other by passing along their tips and tales of tribulation. This month's contributions include nuts-and-bolts instructions for installing half-height drives, cabling a printer, and cleaning the inside of the PC's keyboard.

User-To-User

We Interrupt This Program . . .

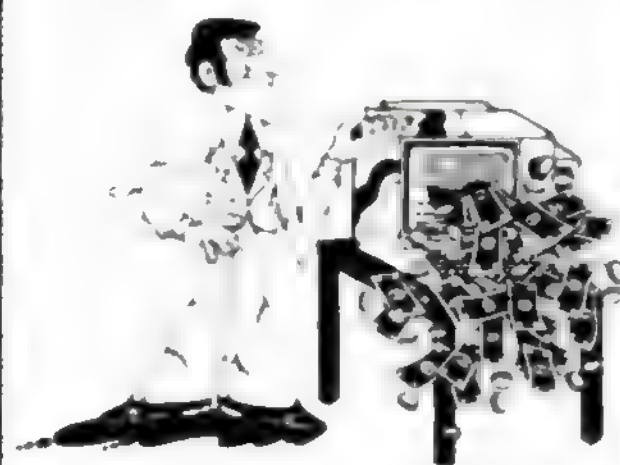
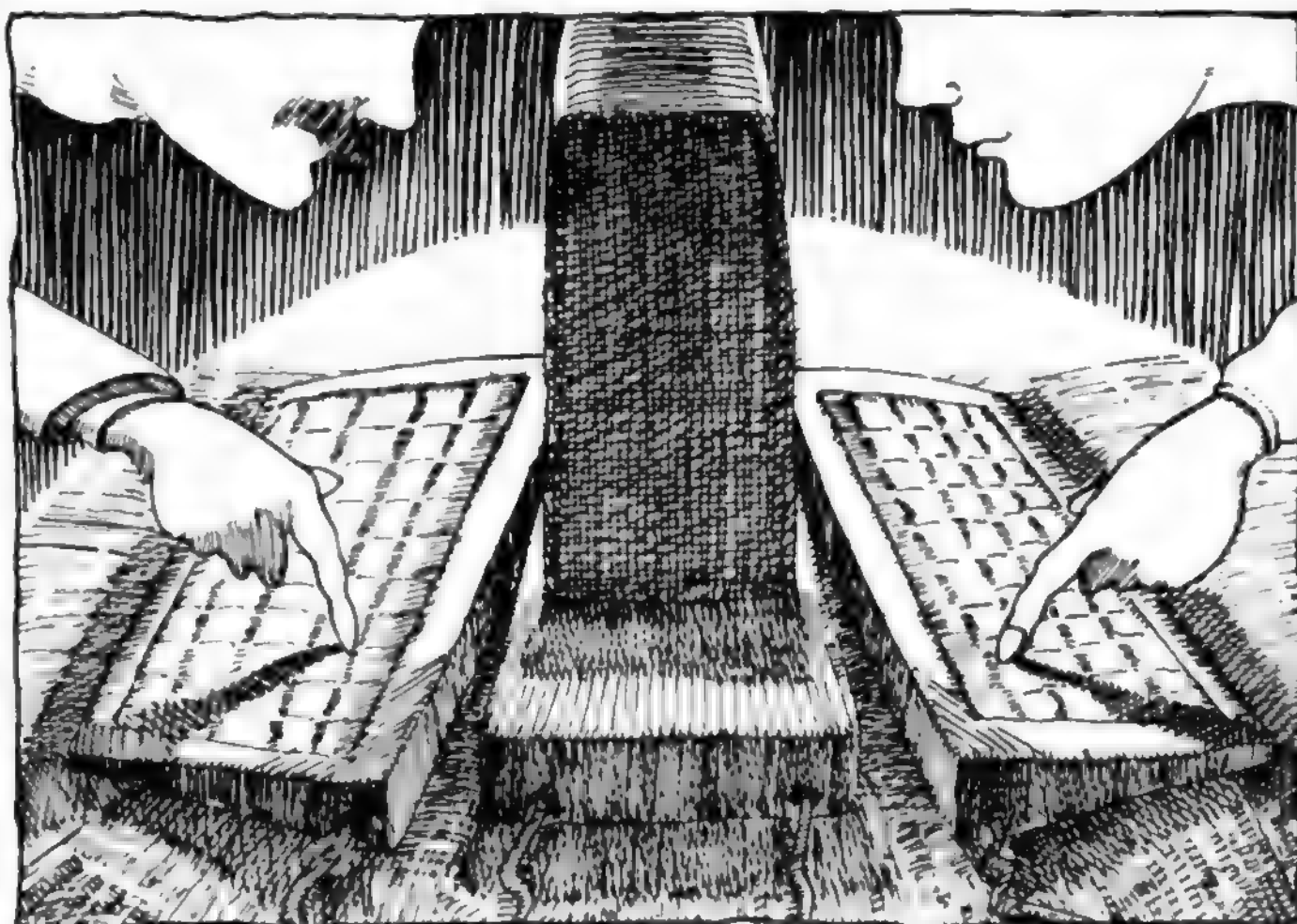
In your magazine a reader asked why the IBM PC would mysteriously hang up during single stepping with DEBUG. I noticed the same problem. Today I discovered why:

The 8088 microprocessor that the PC uses has an internal flag, called TF. When this flag has been set by a program (DEBUG), an internal interrupt (TYPE 1) is generated after each of the computer's instructions is executed. The interrupt forces the computer to a particular memory location where, in the case of the PC, the registers and the instruction just executed are displayed on the CRT.

Now, if an external interrupt to the 8088 (i.e. TIMER) occurs during the execution of the instruction mentioned

above, the 8088 will first recognize the external interrupt. The program counter and flags are pushed to the stack, the TF flag cleared, and the first instruction of the TIMER interrupt service routine is executed. After completion of the instructions, the 8088 acknowledges the internal Single Step interrupt by again pushing the flags and the program counter to the stack, and starts executing in the DEBUG routine. Here the last instruction address executed is popped from the stack (the address of the TIMER interrupt service routine) and is displayed along with the registers and the disassembled instruction.

Everything up to this point is normal for the 8088. It is working as expected. The real problem is that, as far as the PC's interrupt subsystem is concerned (an Intel



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CIRCLE 247 ON READER SERVICE CARD

8259 Interrupt Controller), the TIMER interrupt is the highest priority interrupt pending in the PC. It isn't until the end of the TIMER service routine that the interrupt is cleared. DEBUG has no idea that this situation has occurred and goes merrily along its way waiting for a keyboard entry from the operator. The catch is that

the keyboard is an interrupt-driven device of lower priority and is locked out by the pending higher priority device, the TIMER.

This bug has plagued me from day one. I tried to get it solved through my dealer. I wrote a letter to IBM, but I was referred back to the dealer. Well, IBM still had not

fixed it by release 1.1 of PC-DOS.

Timothy S. Anderson
St. Michael, Minnesota

Dealing with interrupts in real time is a real pain. One possible solution is to disable the timer by zeroing out the countdown register or by masking it out in the 8259A. This, of course, assumes that your program is not making use of the clock. Obviously, your clock will be wrong when you're done debugging. Despite its many capabilities, the PC is not designed to be a logic analyzer or an emulator, and can be a less-than-ideal tool for debugging assembly language programs.

Restoring Erased Files

Here is a simple way to recover a file that you accidentally deleted. Put the diskette with the deleted file(s) into drive B, and a copy of your PC-DOS diskette into drive A. Then perform the following steps:

1—Select drive A.
2—Enter "debug" in response to the "A>" prompt, in order to run the debugger.

3—Use the "load" command to load the sectors that hold the directory for the diskette in drive B into memory. For example, a single-sided diskette has its directory on track 0, sectors 4 to 7.

To load these sectors, enter "1 address 1 3 4" in response to the debugger's "." prompt. This loads four sectors into memory at the indicated address, starting with relative sector 3 (the 4th sector) on the diskette. The "1" is used to select drive B. I have found that using 4BA:100 as the address works fine.

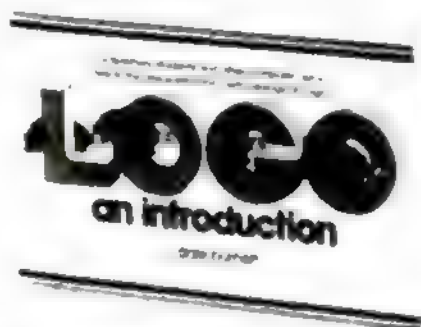
4—Scan the memory locations from the address you specified (using the "dump" command) until you find its name listed in ASCII representation on the right-hand side of the screen. Note that the first character of the filename will be an "e" rather than the correct letter; This is due to the fact that DOS changes the first character of the name to X'E5' to indicate a deleted entry.

For example, if you were searching for a file named "TEST.DAT", you would first issue a "d address" command, and then continue issuing "d" commands until you found the name "eEST.DAT" in the ASCII representation on the right-hand side of the display.

5—Determine the address of the 'E5' byte for the filename, and change it to the

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correct first character of the filename. You would use the "enter" command to do this.

For example, if the 'E5' byte of "eEST.DAT" was at location 4BA:120, you would then use the "enter" command as follows: e 4ba:100 "T".

6—Write the restored directory out to the diskette. Use the "write" command to do this.

For example, to write out the corrections I had made, I would use the following command: w 4ba:100 1 3 4. In effect, this command is the same as the one used to load the data, with the "1" changed to "w".

It is important to remember that the directory for a double-sided diskette is on track 0, sectors 4 to 8, side 0; and track 0, sectors 1 and 2, side 1. This differs from the directory for a single-sided diskette. Operations on a double-sided diskette are thus easiest when performed in two steps: first, on the directory on the first side of the diskette, and second, on the directory on the second side of the diskette.

To load the directory for a double-sided diskette, use this command for side 0: 1 address 1 3 5. Then use this command for side 1: 1 address 1 320 2. Sectors are numbered 0 to 319 for side 0, and 320 to 639 for side 1.

Michael M. Santo
San Jose, California

Although Mike calls this technique "simple," it isn't. Modifying the directory is analogous to playing with a loaded gun. While it's instructive to see how it's done, you may want to consider using one of the inexpensive utility programs that do the dirty work for you. In any event, practice on an expendable disk before you use this technique to salvage a file on an important disk.

Doubling By Halving

For those looking at the Teac Slimline drives for their PC, a couple of comments:

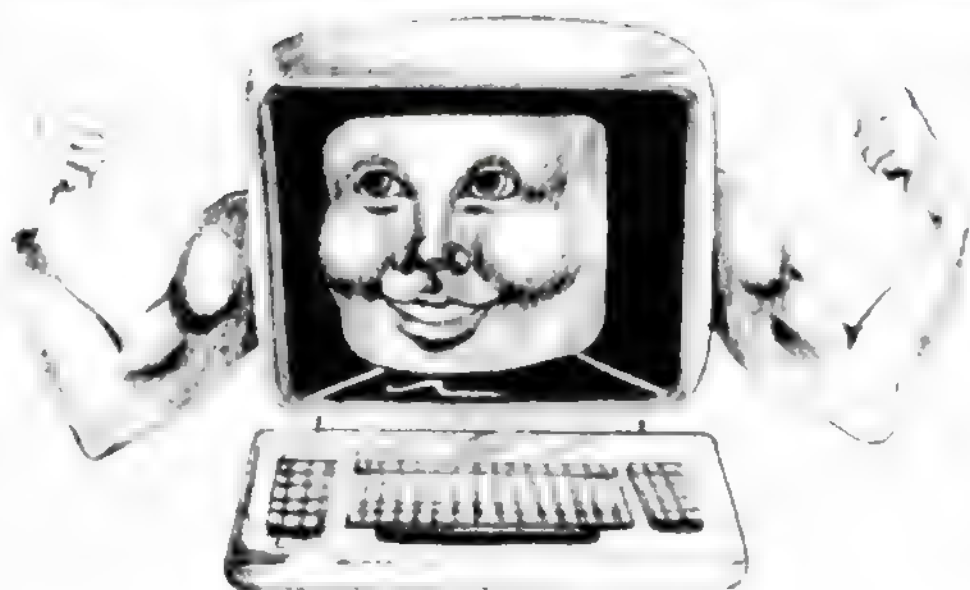
They fit, but just barely. You will need to fabricate a thin strap of metal and drill two holes for the mounting screws to line

up with the drive holes when one is mounted on top of the other. Slide the bottom drive in place, attach cables, and slide the second drive in. The last 1/2-inch is a tight fit. Slide the strap in place next to the drives, and only then attach the bottom drive to the chassis with a screw through the bracket on the inside. Do the same for the back mounting hole and then line up the straps on the top drive and tighten the screws.

There just isn't enough room for the drives to be mounted outside the PC before sliding them into place. They are just a bit quieter than the buzzing Tandons, at least much of the time. Anyone had experience with the 96-tpi units?

Before putting your Teacs into place, however, you may wish to make a slight modification. The Teac drives have a separate head-loading solenoid that is not present on Tandons. Those using PC-DOS 1.1 or Speedup will occasionally have an error if the head hasn't been loaded and a WRITE is issued.

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CIRCLE 233 ON READER SERVICE CARD

One is to write a modified version of Speedup that modifies the tenth word in the diskette parameter table (its address is found by looking at hex 000:78-7B) to some value other than 0. This seems like a step backwards, though. An alternative is to modify the drive slightly. The solenoid is at the left

rear of the drive. The actuating mechanism is a small bracket with two springs wound on its shaft. The rearmost spring has a small hook that can easily be released (and as easily reattached) by using a thin screwdriver or tweezers to push its end towards the front, and then to the left. The head will now be loaded

immediately, just as the Tandons are.

Has anyone tried any of the other drives that are available? I would like to find a quiet drive. Does anyone have experience in mounting four thin drives in the cabinet, and know how to cable and power them? Anyone tried the new Tandon TM55-4 thinline microprocessor-controlled drive, with such features as auto track centering?

Dale Reid

Eau Claire, Wisconsin

These are the kind of explicit directions that users prize most highly. The Teac head-load solenoid is an annoyance, but it's the "right" way to build a drive. Control Data's (MPI) drives are quieter, as are the Qumes. A lot has to do with the step rate. The faster you step, the smoother the drive sounds. I'd also like to hear from those of you using nonstandard drives. Did they install easily? What other modifications did you make? How well do they run copy-protected software?

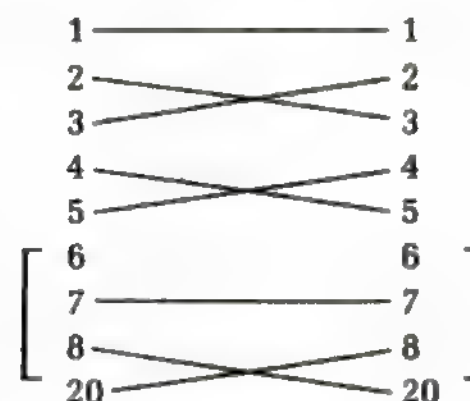
Hot Wiring

I have a Seattle memory expansion board in my PC. In order to use its serial port to run my Diablo 630, I had to reverse pins 2 and 3 in the cable, since the Seattle board thinks it's looking at a modem. All the programs that use PC-DOS to control the printer, such as BASIC and Supercalc, worked fine.

EasyWriter II, however, bypasses PC-DOS and controls the printer directly.

Figure 1: Wiring diagram for cable connecting a Seattle memory expansion board's serial port to a Diablo 630 printer.

Seattle Pin Number (female DB-25 plug) Diablo Pin Number (male DB-25 plug)



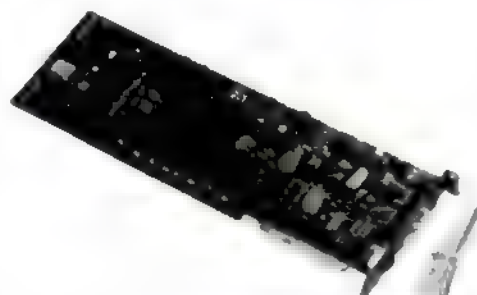
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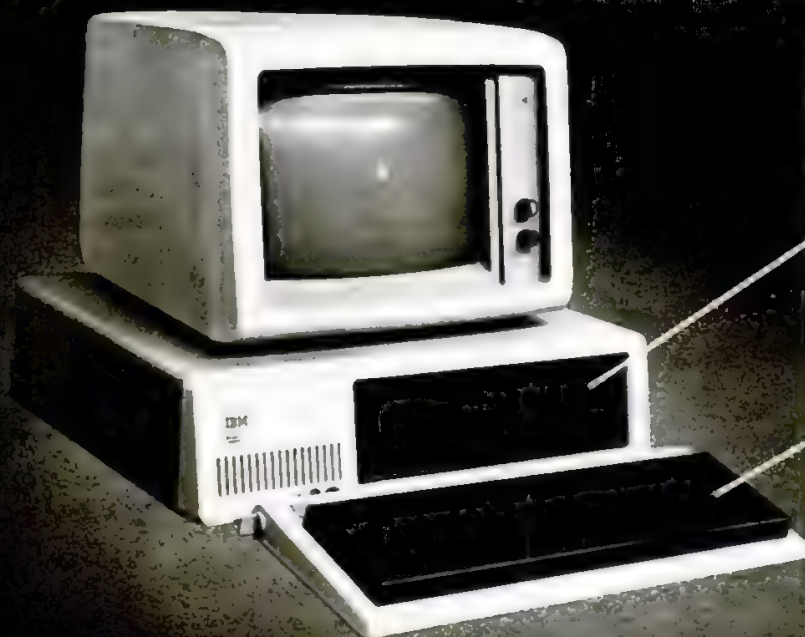
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This is common in word processing programs that must incrementally control a letter-quality printer. My Diablo 630 was not happy with this arrangement, as it stopped unpredictably and generally behaved erratically. The repair people at ComputerLand had no solution, nor, initially, did IUS, the supplier of EasyWriter II.

Rich Brown of IUS finally solved the problem. He suggested rewiring the cable and resetting the size of the ETX-ACK buffer in EasyWriter II. These changes completely eliminated the problem and did not affect the programs that print through PC-DOS. Figure 1 shows how to set up the cable that worked on my system. (Note that pins 6 and 8 are tied together at both ends of the cable.) The ETX-ACK buffer size is now 120 instead of the default 350, which is larger than the Diablo's 320-byte memory.

Cliff Lawson
Oregon, Wisconsin

RS-232 interfacing can be one of the trickiest challenges in getting computers to talk to peripherals or to one another. I plan to put together an article about interfacing in the near future. All reader suggestions and solutions are welcome.

Unprotecting BASIC Programs

This tip has been making the rounds of the user groups lately, but I thought PC should publish it for general consumption. Naturally, you won't use it for unscrupulous purposes!

AS SOON
as I've saved a program
I find that I need to
access it again.

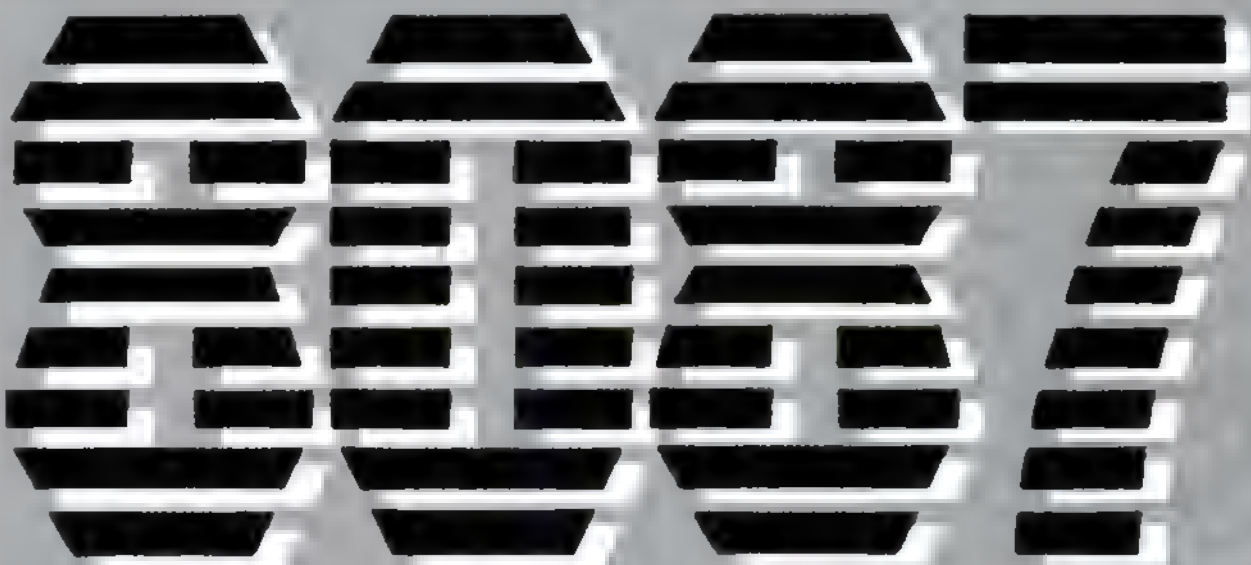
This program will allow you to list a BASIC program that you have saved with the "P" option. With this option you are not allowed to list or access the program you have just saved. In my experience, as soon as I've saved a program with this option I find that I need to access it again. This need resulted in the program, which is created as follows:

1. Load BASIC or BASICA.
2. Type BSAVE"LIST", 1214,1.
3. Load the program that you wish to list.
4. Type BLOAD"LIST", 1124
5. Now list the formerly protected program.

Upon completion of the first two steps,

your directory will show that a new program has been placed on your disc named "LIST"—other name you prefer will suffice. This program can be transferred to other disks or simply recreated on each one.

Russell E. McConnell
Long Beach, California



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CIRCLE 258 ON READER SERVICE CARD

Another One Bites the Dust

After I had used my PC rather vigorously for about a year, keystrokes began to disappear mysteriously and intermittently. I found that turning the keyboard on edge and "rippling" the keys could eliminate the problem, or at least shift it from one key to another. Another PC owner I know

found that he could temporarily eliminate the problem by removing the cap of the offending key and blowing into the opening. Others had similar experiences, all of which pointed toward foreign matter inside the keyboard interfering with normal key operation.

It made no sense at all to buy a replace-

ment without at least trying to fix the fault, so I bit the bullet and removed the bottom cover. The rest is history.

The cover comes off easily with a 1/4-inch nut driver or a flat-blade screw-

THE MOLDED plastic parts aren't gossamer, but they can be broken.

driver, and the cable and connector are easily removed, even without the aid of a maintenance manual. At this point, the keyboard assembly actually falls into one's hands. Then the fear sets in—can anything so simple-looking be repaired?

The answer is: "Yes, within limits." Disassembly is simple, and a simple dusting with a lint-free cloth will eliminate most keyboard faults; but, that just gets you up to where the trouble begins. The really tricky part is to get the whole thing back together without breaking anything. However, I'm getting ahead of my story—back to disassembly.

After removing the keyboard cover, you should remove all of the keycaps except the spacebar. This is easily done by sliding a medium-size flat-blade screwdriver under the keycap next to the key stem and prying until the cap comes off. This is tedious, but it is an essential step whose value will be seen when reassembly is begun.

One screw, accessed from the top of the keyboard, holds the circuit board to the metal frame. Removing this screw allows the top (black) metal plate to be moved to the right, separating it from the bottom (shiny) metal plate. Before actually separating the plates, however, one should make sure that the keyboard is upside-down (keys toward working surface) over a clean work area. Upon disassembly, one finds a printed-circuit board, a number of rectangular plastic key housings, and a plastic plate hinged to move within each housing. These plates are not all the same, by the way, so don't swap them around (unless you drop them and have to make a decision,

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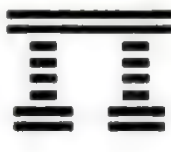
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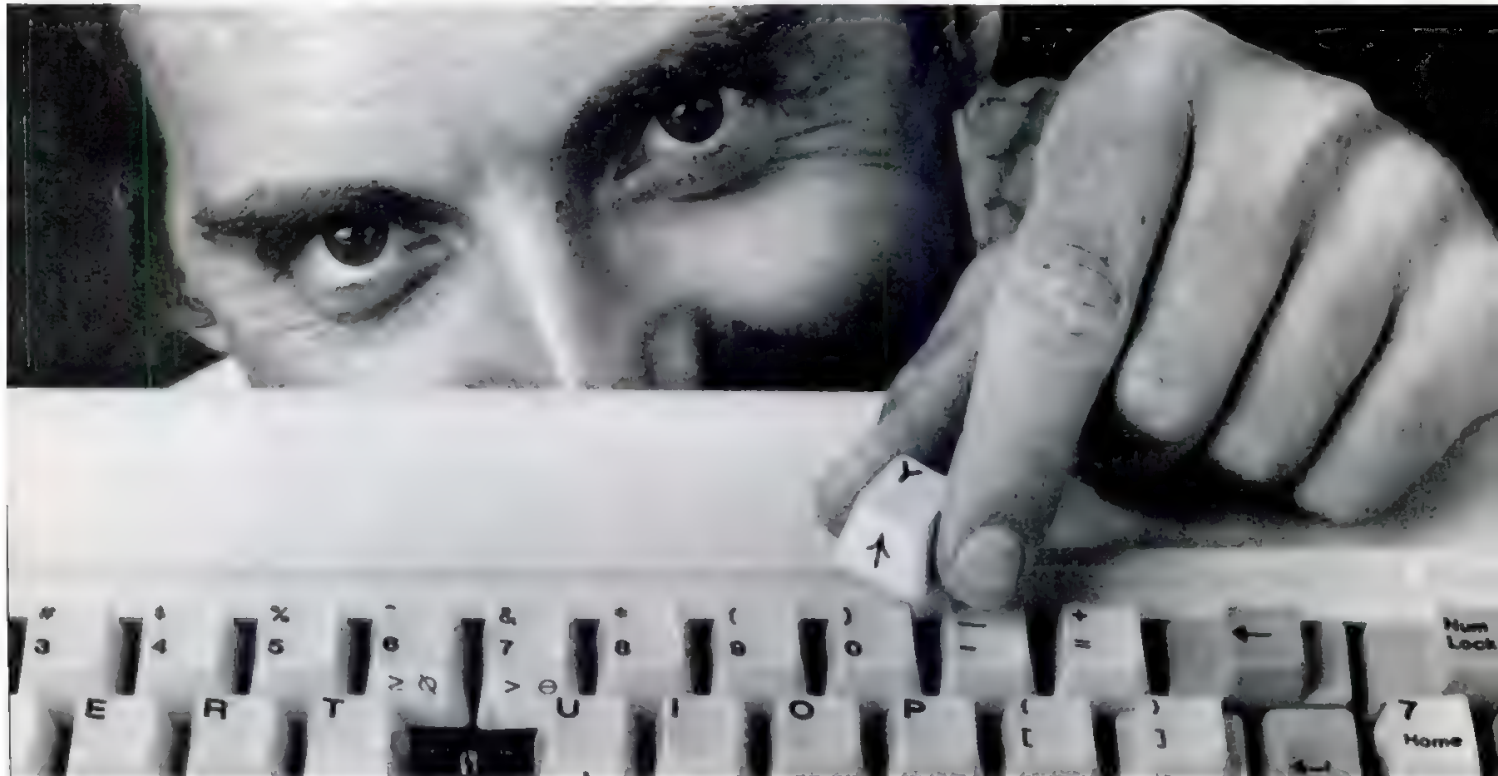
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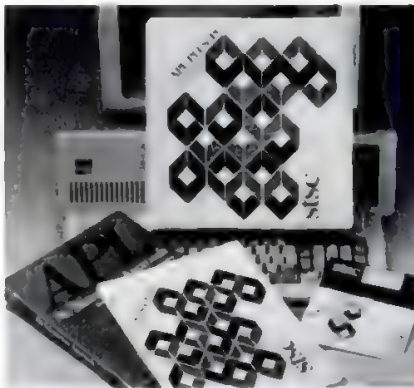
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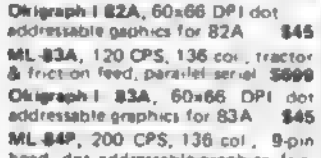


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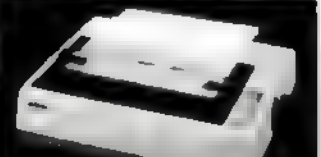


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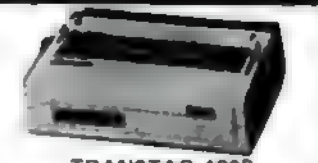
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in which case I heartily endorse referring to a two-headed coin). A coiled spring is attached to each plate. It should not be removed.

The molded plastic parts aren't gossamer, but they can be broken, so careful handling is advisable. One of mine broke, and I succeeded in getting it back together with some acrylic "super" cement, but not before considering a venture into occult mechanics. In retrospect, if I then had the simple instructions that I'm providing here, the job could have been done without creating such a problem.

At this point, I found a number of bits of extraneous matter floating about, both in the key housings and on the printed-circuit board. I carefully used a damp, lint-free cloth to wipe these gremlins out of my life. Then came the hard part: reassembly.

All of the plastic plates should rest comfortably in their respective housings, with the exception of the space bar. Now, it is obvious why I said to remove the key caps first—I spent several hours of work regretting not having done so in the first case. The plate for the space bar can be moved into position by hand, and held there with the aid of a thin, firm shim: I used a 0.020-inch feeler gauge.

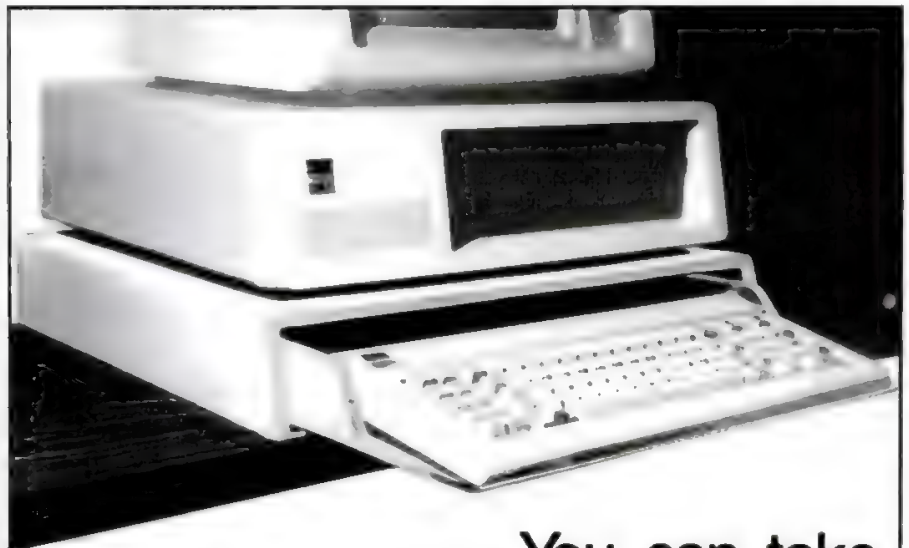
At this point, either an assembly jig or an extra pair of hands is called for. I enlisted my son's aid. One person holds the assembly in place (key side down, shim retaining the space key) while the helper aligns the black plate tabs in the shiny plate slots, then slides the plates together. We found a pair of needle-nose pliers inserted into the round hole at the right edge of the shiny plate provided an admirable lever to slide the black plate to the left, engaging the tabs. Once the two plates are firmly locked together, the screw can be reinserted. The case assembly procedure is reversed to complete the major assembly. By the way, be sure to get the cable's ground lug between the back plate and the mounting stud. It must make firm contact with the metal bottom plate.

Finally, refer to the keyboard layout diagram in the Guide to Operations manual to reinstall the keycaps, making sure that the spring of each key is centered in the key stem. That's all there is to it!

David F. McManigal
Stormville, New York

Thanks for the carefully guided tour through the keyboard's innards. Can the same thing be accomplished with a shop vacuum and a brush attachment?
/PC

Remember that "User-To-User" is your column. Send contributions to "User-To-User," PC Magazine, One Park Ave., New York, NY 10016. Please double-space all contributions, provide clean copies of program listings, and include the name of this department on your envelope.



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Manufacturers and users should admit that the PC and its software are complicated enough to make training and study worthwhile. Also, IBM admits that its mystery socket is for the 8087.

Learning What-To-Do As Well As How-To

At the same time as the PC universe continues to expand and grow ever more complex, software vendors vigorously claim that their products are "easy to use" and "simple to learn." In some cases those claims are justified, but in many they are not. My general view is that the PC, with its associated software products, is a rather complicated system for the average user; it's tough even for experienced users.

I've heard different users' stories about the same product with exactly opposite conclusions: "GalactiCalc is sooo easy to use, I learned it in five minutes and it's been saving me time ever since" is one extreme. The other: "GalactiCalc? If I ever find out who built it I'll . . ." or "I just can't seem to get the hang of GalactiCalc, I think I can do it by hand faster." That's quite a range of reactions.

The IBM PC, or any other computer

that is used for general purpose work, is a complicated device. It requires a learning process, some time to get familiar with the machine and come to understand it. It

A LOT
of computer users have
the notion that you
should be able to learn
as you go.

requires study and concentration. And in this way, it is no different from most things we use in everyday life. We all take driving automobiles for granted, but we all

had to learn the rules of the road, pass a written test, and prove that we could do it by passing a road test, not to mention the practice time we spent to get the hang of it. I recall a *Battlestar Galactica* episode involving a visit to 20th century Earth. As high-tech pilots flew over an expressway in their incredibly advanced flying machines, one noted the "precision" with which the automobile drivers below moved together along the road. While we might laugh at this observation because we take our driving for granted, it provides an interesting insight.

A lot of computer users seem to have the notion that starting to use the computer ought to require nothing—you should be able to learn as you go. Such people are, I think, too optimistic about the capabilities of the machines of our day. They are also too impatient to accept the learning process. They tend to prefer a system that

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leads them by the hand every step of the way, with menus, extensive on-line help, and very sensitive error-handling and recovery. What is usually sacrificed in such systems is performance. The user is forced to always wade through long menus, making selections one at a time. An expert user tires of this very quickly because the process wastes time that could otherwise have been used for productive work.

***E**XTRA SECONDS are not trivial to an individual using the system day in and day out.*

Proponents of menu-driven systems argue that the few extra seconds such systems make you wait are trivial, and allow a less well-trained individual to operate the programs. You can't argue with equal opportunity and motherhood. The extra seconds are not trivial to an individual using the system day in and day out, however. Such users soon become experts, understand the system, and know what to do in almost every conceivable situation. They rapidly tire of the repetitious menus and slowness of operation.

These advocates of the so-called "expert" interfaces argue that the time and effort for extra training and study are more than offset by the long term benefit of speedy and efficient use. I find this is a rather strong argument, especially when accompanied with an exhibit of a VisiCalc expert building and using spreadsheets. I use the VisiCalc example because most versions of the program, at least until this point in time, had what I refer to as a "minimum keystroke" human interface and no on-line help.

Bridging the Levels

For a long time, programs seemed to fall into one or the other of these two classes. WordStar may have been the first program that attempted to bridge the two styles by offering an on-screen menu facility that could be eliminated in stages as the user progressed in expertise. But a

new type of human interface is emerging that combines the better characteristics of both classes with no loss of performance. It is perhaps best illustrated by Microsoft's Multiplan spreadsheet.

Multiplan can be operated in one of two ways. At any given time, a menu at the bottom of the screen displays all the options in the form of command words. One of the options is highlighted, and can be selected by depressing the Enter key. The highlighting may be moved by depressing another key until it appears on the desired command, which can then be selected. Furthermore, an explanation of the highlighted option can be had by depressing a Help key. Once the system has been learned, however, the user can simply press the first letter of the command name desired, a method that is about as fast as is possible. In addition, Multiplan makes certain intuitive leaps in response to input. For example, the user can often successfully enter a formula or value at a time when the system initially

***A**CCOUNTANTS and clerks took to VisiCalc like ducks to water because they already understood the underlying concept.*

expected something different; this can be done if the program can unambiguously distinguish such input.

There are other similar human interfaces that are directed towards a broad range of users. It is important to note, however, that such programs address themselves to the question of how to use the system. There is a much more important question: What is it that the system actually does?

The concept underlying a program is much more important than the details of its operation. Like automobiles, many of us take the operating characteristics of VisiCalc for granted. What made that program the all-time best seller was not that it was easy to learn and use, but that what it did was so useful. Accountants and clerks

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took to it like ducks to water because they instantly saw the purpose for which the program was meant and already understood the underlying conceptual issues. From there, it was simply learning how to get the program to do their bidding, a simple task by comparison.

My attitude about training aids hinges on this very point. If an aid only teaches how to use the system, then it may not be much better than the manual that comes with the product. I'll use VisiCalc as an example again: The manuals supplied with it are of pretty high quality as far as explaining the how-to part. Most of the other books written about the program, however, deal less with how-to and more with what you can do with it.

I suppose my own worst encounter was with a training aid for dBase II. The package did a very crisp job of explaining how to use the program interactively to create and then manipulate data in a file. However, the key to the success and power of dBase II lies in its ability to execute lists of commands from files, not in its interactive capabilities—the fact is that dBase II is a programming language! The training aid gave no indication of this facet of the product. Actually, if all that's needed is simple interactive processing, the Freeware product PC-File at \$35 is probably just as good as the much more expensive dBase.

My point is simple: Look for training materials that put emphasis on the what and why, rather than on the how-to.

IBM Admits to the 8087

IBM made a number of announcements regarding new products for the PC in June, catching me off guard. In the past, it has usually called its new products "enhancements." This time, they were called "capabilities and programs." I'm glad my living doesn't depend on second-guessing IBM.

Included were APL, LOGO, and Private Tutor, a program that allows course materials to be designed and presented. Three courses for the tutor were also announced: *Learning DOS 2.0* (much needed, I think), *Multiplication Tables*, and *Learning to Program BASIC*.

The most significant announcement was "The IBM Personal Computer Math Co-processor"—known to most of us, of course, as the Intel 8087 numeric processor. The kit can be used on either the PC or XT models, and includes both the 8087

and the most current version of the 8088 chip. Although the reasons for this are complicated, some older 8088 chips do not operate properly when the 8087 is

IT IS
*possible that calc
programs would show
significantly improved
performance if upgraded
to use the 8087.*

installed. The newer chips were made available in mid-1982, so quite a few PCs will require the new processor chip. The price of the option is \$260 at IBM product centers, which is quite competitive with the open market prices of between \$250 and \$300 (or more) for equivalent packages.

IBM announced little software to support the chip, which is sad. I am absolutely positive that such announcements will follow promptly, but for now we are limited to the new APL software and programs from other sources that already take advantage of the 8087.

The significance of the announcement is simple. The PC's 8088 CPU by itself is no match for the Motorola 68000 processor with its 16-bit data path and larger logical address space. Whenever you get near a salesperson for a computer using the 68000, he or she pounds you with the performance issue. For numerical applications, however, the 8088/8087 combination is very powerful, in some cases more so than just a 68000. It is even possible that the calc programs would show significantly improved performance if upgraded to use the 8087.

It is obvious that IBM planned this all along. The open socket has been on the system board since day one. Everybody but IBM representatives knew the purpose for which it was intended. Whatever IBM's reasons were for the timing of its announcement (two possibilities: reliable chips or strategic marketing), the 8088/8087 combo will allow IBM to sell the PC in market niches heretofore closed to it.

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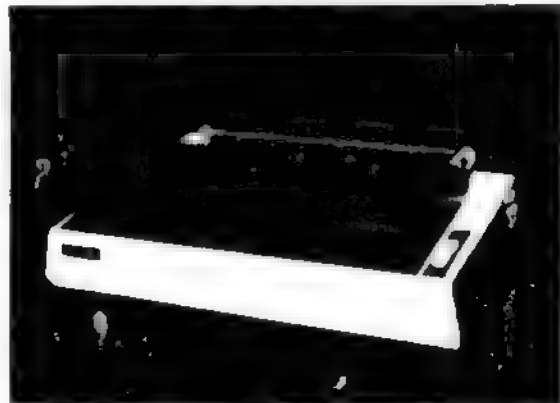
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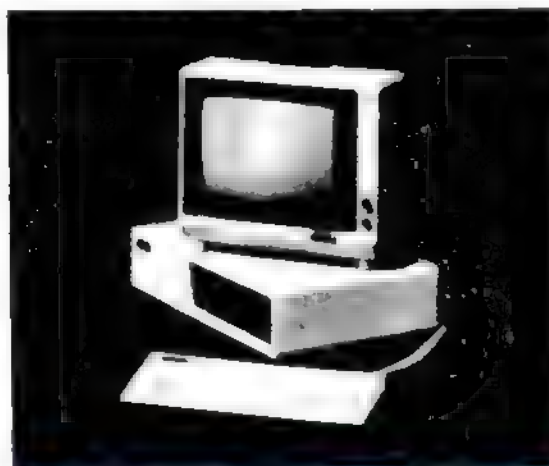
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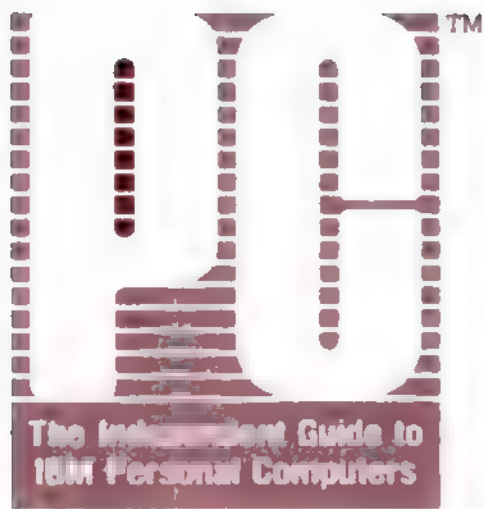
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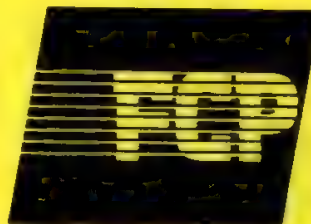
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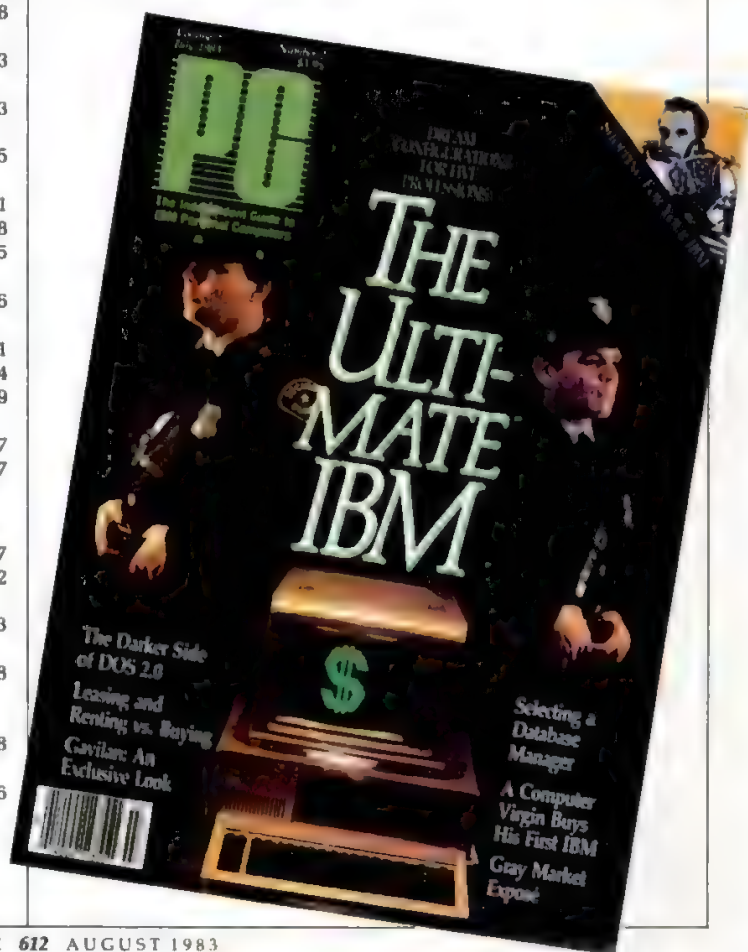
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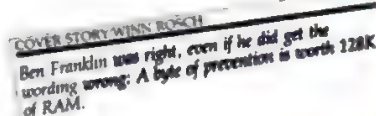
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AVOIDING THE WORST

Now that it costs only a few grand having a computer with that unique three-letter stamp—Bill makes the story with a capital and status of pride. A natural inclination of this creature is a desire to let his special name on the machine doing whatever you want to keep it looking above-all new and shiny on it again.

Join the Greater

At first blush it might seem that pay-
ing maintenance and care on your
ware that programs PC owners must
left a danger to keep their computers

The construction of the IBM PC philosophy was to build as reliable every-day computer as possible placed IBM equipment. One to "We tried to design a machine required a minimum of personal maintenance. And to give the best advice on taking care of the machine." That was the idea.

And here you


them. According to Schwarz, the best preventive measure is to avoid placing the PC in a hostile environment. In general, the PC will perform best if the noise temperature and humidity contribute less to the overall noise level.

The company should be given more consideration as important business records but as a spoiled nip of coffee would be disastrous to a paper mill the PC hardware would likely contribute to such a disaster in other words have comprehensive coverage over the equipment is covered by the

Flippy disks for the PC (or any other computer) require a bit more care than paper counterparts. The following are recommended:

- Lamp data every two minutes as those created by its equivalent transducers and electric meters.
- Data from each device can be more intelligible stored data.
- Take care to always keep the inside their production observed.

- When readying a supercharged engine, the driver must be inserted into a drive guard against the engine's rotation, preventing the engine from turning through the shaft in the case. The driver must be inserted into the shaft of the engine, and the driver must be inserted into the shaft of the engine.
- Not only are cigarettes, but there are also many other things that are not allowed in the engine.



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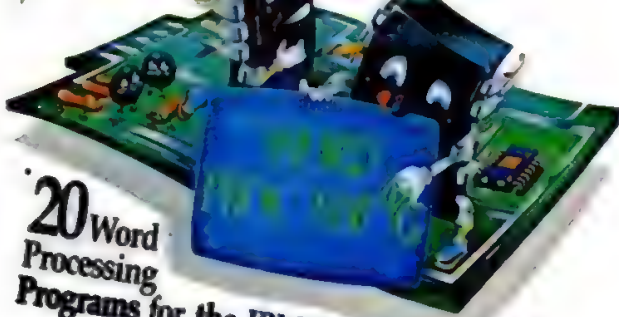
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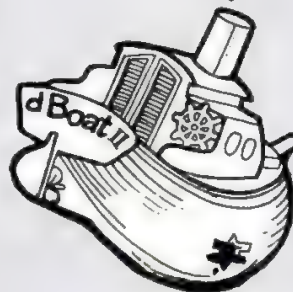
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TAPPING INTO TELEX

TLX-A-SYST

XYZZY

P.O. Box 9002-16

Boulder, CO

(303) 444-6675

Telex 4990706 (XYZZY)

List Price: \$250

Requires: 64K RAM, one disk, serial port, modem, word processor, ITT Telex service

Distributed by: American International

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1207 Elm Ave.

Carlsbad, CA 92008

(619) 729-2168

CIRCLE 693 ON READER SERVICE CARD

A Telex number at the bottom of a sheet of letterhead adds a certain cachet; it implies a kind of style and status. But

more importantly, it reveals that the sender is part of a global network.

Telex communications have traditionally been the preserve of corporate busi-

I DIDN'T
*understand the
questions about
password and
answerback names.*

ness, the communications industry, government, import-export houses, travel agencies, and anyone else who needed quick, worldwide communications capa-

bility.

Now, you can communicate via Telex with your PC from your desk at the office or at home.

The secret's in the software, specifically a program called TLX-A-SYST, a product of XYZZY of Boulder, Colorado. Two weeks after I first inquired about TLX-A-SYST, I was assigned a secret password, an answerback identification, and was told a Telex number would arrive soon. I was puzzled: Why would Telex want to give me a number? But I quickly learned the facts that would make me part of what is possibly the least expensive electronic mail system available.

Telex itself does not assign a number; it is provided by one of several services that use Telex. ITT was recommended because it charges neither a monthly nor an initiation fee. You pay only for your Telex calls.

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It provides undedicated lines, and telephone access is provided by toll-free numbers.

I was told to call ITT World Communications, ask for a form to fill out, and in about 2 weeks I would have my own private Telex number. I would be listed in a Telex address book and be able to communicate with anyone else who uses Telex through ITT or any other Telex service.

I was cynical, but I followed through. I phoned ITT at its (800) 424-1170 number, which was listed in my local phone book under ITT. I spoke to an account representative. Everything I had been told was evidently true. "Yes," I said, "I'd like to apply for a number." I was asked for my business name, my name, address, and phone.

I asked what I'd need, thinking I would be asked for my Dun and Bradstreet account number (which I don't have), my annual income (which I didn't want to reveal), references (which I would be reluctant to provide), my list of charge-card numbers (which I resent giving). The account representative answered, "A modem, any kind, that will transfer at 300 baud, a computer, the necessary software, and a word processor."

I qualified on all counts. Two days later I received the form to fill out. I didn't understand the questions about password and answerback names, so I left the lines blank. My account representative called and suggested a password composed of a six-letter derivative of a name I sometimes

In the process, I discovered Al Collins, a man in my local computer society, who has been using Telex for years to conduct business in Australia, Fiji, the Cook Islands, and throughout the United States. I spent a morning with Al in his California backyard office. He convinced me that my PC could expand my contact with the world without budging me from my tiny office at home.

At Al's suggestion, we used TLX-A-SYST to send my brother a happy birthday note at his Dallas office. I didn't know his Telex number, so we phoned the ITT toll-free number and asked for Telex directory assistance. (It was a weekday during business hours; off-business hours, we would have called ITT, via Al's Telex number.)

I prepared the short message on the word processor, naming it BIRTHDAY.TLX. I brought the Telex program on screen using Al's password, transmitted the file BIRTHDAY.TLX to the Dallas number. In less than a minute, my message traveled from California to Dallas.

Al sat back and said, "No looking for a card that would cost you about 85 cents. No 20 cents postage. No rush to get it in the mail 3 days ahead of his birthday. No wondering if it will arrive on time."

"So what did it cost?" I asked.

"About 50 cents," he said. "Ok, now let's see what you can do with Telex in the world of big business."

Al brought up his own program and showed me messages he had sent that were "archived" on disk. "Archived" means there is a log showing the date, time, and messages sent. He could also access the message and print it out, if he liked. Although impressive, these capabilities were surpassed by the case histories he then related.

One account involved the government of Rarotonga. He had to show me where the country was—pointing to a flagged pin in the area of the South Pacific on a wall map. Other pins indicated the location of the countries he contacted regularly: Australia, the Cook islands, New Zealand.

"We installed computers in Rarotonga and had a few problems getting one of them to boot up. Here," he said, hitting a few keys, "that's the message to Rarotonga—and the answer."

Immediately the dialogue appeared: a few short, cryptic messages that were

archived on the disk. "The computers were humming 2 hours after the first message. Can you imagine how much time it would have taken to get phone calls

**WE USED
TLX-A-SYST to send my
brother a happy
birthday note at his
Dallas office.**

through and wait while they tried to do this or that? Can you imagine how many days it would have taken to send letters back and forth? Not days. Weeks!"

How much did those Telex messages to Rarotonga cost? He checked the message dates and looked up the bills for that month. Billing is by Telex number, message duration time, and cost per minute. The total was \$8.40. (Most overseas destinations are charged at \$2.90 a minute.)

"Fine," I said. "But not many of my readers deal with someone in the South Seas. What if I only want to send messages to New York or Chicago, or even Los Angeles, only 125 miles up the coast?"

"Same thing, but cheaper: only 50 cents per minute anywhere in the United States. But the impact is worth hundreds of dollars, and the convenience is incalculable. You don't worry about business hours, time changes, lunch time, or a person not being there. Compare that with 3 to 5 days for a letter. With Telex they get the message immediately and they answer."

Out From Under Telephone Tag

Other users I interviewed joined in praise of Telex. Eliminating the game of telephone tag was the reason most often cited.

How often have you been involved in this scenario? You want to contact someone who is not in when you call, once, twice, three times. Or you get the wrong person and you're deployed from one extension to another, from one screening secretary to another, and you have to state your business to each. Then the person

**CAN YOU
imagine how much time
it would have taken to
get phone calls
through?**

use as a free-lance writer. My answerback word was "Meilach." Very creative.

A Seasoned User

While waiting for my Telex number, I pursued the possible advantages of having a Telex number and the required software.

you want isn't there. Maybe he gets the message scribbled on the back of an envelope, if it doesn't get lost on his desk. Or he doesn't get back to you for a couple of days, or at all. Or he may call you back and you're not there. You call again and go

THE STORE and Forward utility holds your messages until you ask for them.

through the same routine.

On the other hand, a Telex sent to a company will go directly to the right person, and it will be placed on the proper desk and carry the connotation of immediacy, of something really important. Why? Because it has a psychological impact; it spells action.

One user said he uses Telex regularly to alert an associate in a branch of his company in a different city that he wants to

talk to him. "The Telex establishes the time and what I want to discuss. My associate confirms the date by Telex. When the phone call is made, we're well prepared to discuss business."

An importer told me that without Telex he might as well give up doing business. "I can place orders and get a reply faster than by any other means of communication. Within minutes, or, at most, hours, I have an answer back as to whether the merchandise is available, when it will be shipped, by what carrier, and when to expect it," he said. "I can request information about shipments all over the world, regardless of time changes. Within hours, depending upon the working schedules in other countries, I'll have my answers."

Further Demonstrations

I was convinced, but I still had some reservations. I needed a demonstration.

What if your computer isn't on when the message comes in? Most of us can't sit and wait for messages. We have other things to do with our computers.

ITT has a Store and Forward utility. It holds your messages until you ask for them. When your computer is on, you

bring up the TLX-A-SYST, phone the access number with your modem, the TLX-A-SYST makes contact with that computer at ITT World Communications headquarters in Washington D. C., and you ask to receive a message. If there's a message it will appear across your screen in a manner that emulates the Telex machine used in newspaper offices and radio stations. You can decide if and when you want to spill it onto your printer.

So how do you make this all happen with your PC? I've already told you how to get a Telex number. But there is more to it than that. You will also require a modem (and an RS-232 modem port with the necessary RS-232 connecting cable), the communication software, and a word processor. For anyone just beginning to tap the world of electronic communications, TLX-A-SYST is one of the easiest software communications packages to use. It offers logical menus and simple procedures. It also accommodates any of the three types of modems available: a direct connect, an auto dial, or an acoustic coupler.

TLX-A-SYST actually turns any personal computer into a Telex terminal and receiver. Once you have a modem configured for your PC and plugged into the electrical outlet and the telephone, you're ready to go.

Place TLX-A-SYST program in your A drive with a word processor. (A minimum-density single disk drive system may not handle the program, which has 19 files and uses about 120K disk space.) With your word processor, prepare your messages according to the protocol of tele-

Figure 1: Main menu of TLX-A-SYST program.

```
***MAIN MENU***
1 - TRANSMIT a Telex Message
2 - RECEIVE a Telex Message
3 - PRINT or DISPLAY any Archived Message
4 - PRINT or DISPLAY Message Traffic Log
5 - VIEW or MODIFY your Personal Directory
6 - SET the system as you like it
E - END
? - HELP
```

ENTER YOUR SELECTION ===>

Figure 2: Transmit Menu of TLX-A-SYST program.

```
***TRANSMIT MENU***
1 - File to be sent                      ===>
2 - Send to Telex number or ASYST code  ===>
3 - Send to Answer Back                  ===>
4 - Number of copies to print            ===>
5 - Transmit the Telex
V - View your personal directory
M - Main menu
? - Help
```

ENTER YOUR SELECTION ===>

TXLX-A-SYST is one of the easiest software communications packages to use.

type communications (which is spelled out in the literature). The protocol specifies that lines must be no longer than 68 characters and must always end with a carriage return. You must avoid a string of

periods (.....) and semi-colons (;). Each has special significance in Telex transmission.

When your messages are ready to send and given file names and an extension, call up A>Telex. You'll be asked for your password. You type it in, but it is not displayed on your screen so that no one can eavesdrop (eyedrop?). Then the program logs in.

Next you establish the date, time, and your identification. TLX-A-SYST utilizes the built-in clock of the IBM PC, so it is not necessary to type in the time when you log into Telex. You are immediately placed in the main menu from which you elect to transmit or receive messages.

The program consists of a series of short menus. Any questions are quickly explained in the corresponding Help Menu.

Before you can use any of the menus, you set up the configuration file, which can be updated instantly by the menu. Only six items are required for configuration: the type of modem you're using, the baud rate, local telephone access number, whether or not you want archive messages transmitted, and the number of copies for Telex to print. If you change an item, hit U

THE WORDS
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friendly award of the
year.

for update and it's done.

The reason for the telephone number? An auto-dial modem will call the number automatically. With other modems, the number appears on screen, so you don't have to look it up. It's nice to know you can use SPRINT or MCI numbers as well as numbers that have more than the usual

seven digits.

You always work in and out of Main Menu (see Figure 1). It is available by using the letter M from any of the other menus.

Entering the NUMBER of the desired item will bring up that menu. For example, 1 for TRANSMIT a Telex MESSAGE gets the Transmit Menu (see Figure 2).

The Receive and Print Menus are similar and need only minimal answers to start the required action.

A convenient feature is the personal directory of Telex numbers, also available via a menu. It allows you to keep a directory containing up to 312 entries on disk. (A complete USA Telex Directory is available free of charge from Western Union. The overseas directory is very costly.) The program also maintains a detailed traffic log of all messages and the ability to archive (keep a copy) all messages stored on disk, given ample disk storage space. When you run out of space, old messages can be deleted or backed up to a storage disk.

TLX-A-SYST, like most programs, is simple to use once you know how. But until you get it all together, it is not as obvious as the manual claims. It does, however, concede that you need hands-on experience to understand the menus and how they interact.

Manual Help

The manual contains all the information you need with only a few exceptions. The words simple, easy, as you can see, as you probably know, and all you need are overused in an effort to qualify for the user-friendly award of the year. I tend to be put off by the word simple in any documentation, especially when it appears two or three times in one paragraph and I am struggling.

The documentation is the usual 8½-by-11-inch typewritten, photocopied print-out. The use of subheads, boldface type, and underlining would have relieved the visual boredom of the document and emphasized important information. In an effort to make the "simplicity" of the program a reality, the manual could have been condensed by about one quarter.

The appendix contains installation notes for specific machines including the IBM PC, two pages explaining possible error messages, a glossary, and an index.

Pages are numbered by sections, so actual size is hard to report.

THERE IS
*no way to stop a
message once it is being
sent except by turning
off the machine.*

Reservations and Suggestions

Only two criticisms of the program were registered by Al Collins, whose judgment I respect. One is that there is no way to stop a message once it is being sent except by turning off the machine. When would that be necessary? What if you were sending a long message to a foreign country at \$2.90 per minute, and you discovered you were using the wrong file or the wrong Telex number?

Second, there is no utility for communicating directly via the keyboard, which makes immediate dialogue impossible. All messages must first be created on the word processor and then transmitted.

A company spokesperson explained that the purpose of the program is to make it easy for anyone to use Telex without previous experience. Their theory is that it is better to plan your messages in advance and then send them.

There are other transmission programs available and often any good modem program will be able to handle Telex messages, but not with the same sophistication as one prepared specifically for transmitting Telex numbers. (There are Telex carrier services in addition to ITT, such as Western Union TWX, and RCA.)

If you decide that a Telex number can increase your communication efficiency, be sure to investigate the various services, software, and applications from your specific area and with your equipment. All modern communication services are subject to change and have their own peculiarities. Always ask the communication service for details of any restrictions, especially if you anticipate overseas Telex traffic.

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Coming Up In *PC Tech* Journal

Program Editors

These software tools, similar to word processors, help programmers transcribe their thoughts into an electronic medium. Our comparative evaluation will examine many of the program editors now available.

Freeware

An experimental method of distributing software: Authors make software available free of charge and ask for voluntary contributions from satisfied users. We take a look at how well this method works and review three programs available as Freeware: PC-Talk III, PC-FILE, and CHASM (the Cheap Assembler).

DOS 2.0

Microsoft claims the PC's operating system is now a bridge to Xenix, but it still has more rivers to cross.

IBM FORTRAN

What are some of the problems with the PC's version of this scientific programming language?

Converting Word Processor Files

How to modify data files created on one word processing program to run on another.

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Coming Up



The Microcomputer Future

Experts look ahead through the end of the 1980s and see the IBM PC continuing to set the pattern for personal computers.

The Art and Science of Programming

The September issue of PC will examine the tools and techniques used by programmers and celebrate the joy and frustration of creating software.

Programming Languages

Over a dozen programming languages are available for the PC. We'll discuss several versions of BASIC, COBOL, UCSD Pascal, APL, C, assembler, and others. This survey will test how fast and how well each language performs different functions.

Birth of a Program

The creators of Volkswriter, 1-2-3, and Snooper Troops tell about the labor pains that preceded the emergence of their popular software.

Linkers

The gap between different operating systems can be bridged by linker software. An experienced programmer tells how it's done.

The 8087 Math Co-processor

IBM has released a chip that enhances the speed and math performance of the PC's 8088 microprocessor. We'll explain what the 8087 is, what it can do, and how you can use it. A tutorial shows how to call on its capabilities from a BASIC program. Also, a resource guide to hardware and software products that are ready to take advantage of the 8087.

The Mythical Man-Month

In 1974 Frederick Brooks wrote a book about the lessons he learned from managing the team that developed the operating system for the IBM/360. His uncommon sense can save programmers and managers from mistakes that still plague today's microcomputer industry.

Peter Norton

The first installment of a column by the creator of *The Norton Utilities*. He will explain technical aspects of the PC and digress on the philosophy of computing.

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IS << MEMORY ⚡ SHIFT >> A \$99.⁰⁰ LISA?



CAPABILITIES:

• **UP TO 9 PROGRAMS IN MEMORY AT THE SAME TIME!**

<< MEMORY ⚡ SHIFT >> is a \$99 program which turns your IBM-PC or XT into 9 computers, all using the same keyboard and monitor, but each using its own diskettes! A training program can be placed in one partition and the real program in another partition—imagine how much faster and easier learning can be! DOS commands are now ALWAYS available. Back up a disk at any time!

• **MOVE DATA FROM ONE PROGRAM TO ANOTHER PROGRAM!**

In just seconds, move a column of numbers from word processor program to spread sheet program for addition, then move the answer back to word processor. NO PROGRAMMING IS NEEDED! Add Super-Calc capabilities to WordStar! Move a name and address directly from a data base into the body of a letter in word processing with just the touch of a button.

• **SEE TWO PROGRAMS AT THE SAME TIME!**

Each of the 9 partitions can be assigned to either monitor 1 or monitor 2 (requires the Color/Graphics card and another monitor). See a program in monitor 1 while watching a training package in monitor 2. Compare two similar programs side by side!

• **99% COMPATIBLE WITH ALL PC/XT SOFTWARE AND HARDWARE!**

<< MEMORY ⚡ SHIFT >> works with your existing program, and can be used with floppy diskette drives. Each partition keeps track of its disks. No need to worry if the wrong diskette is mounted, << MEMORY ⚡ SHIFT >> keeps track of them for you. << MEMORY ⚡ SHIFT >> runs only on the IBM-PC/XT under DOS 1.1 or 2.0.

Available at all **ComputerLand** stores and other fine retail stores.

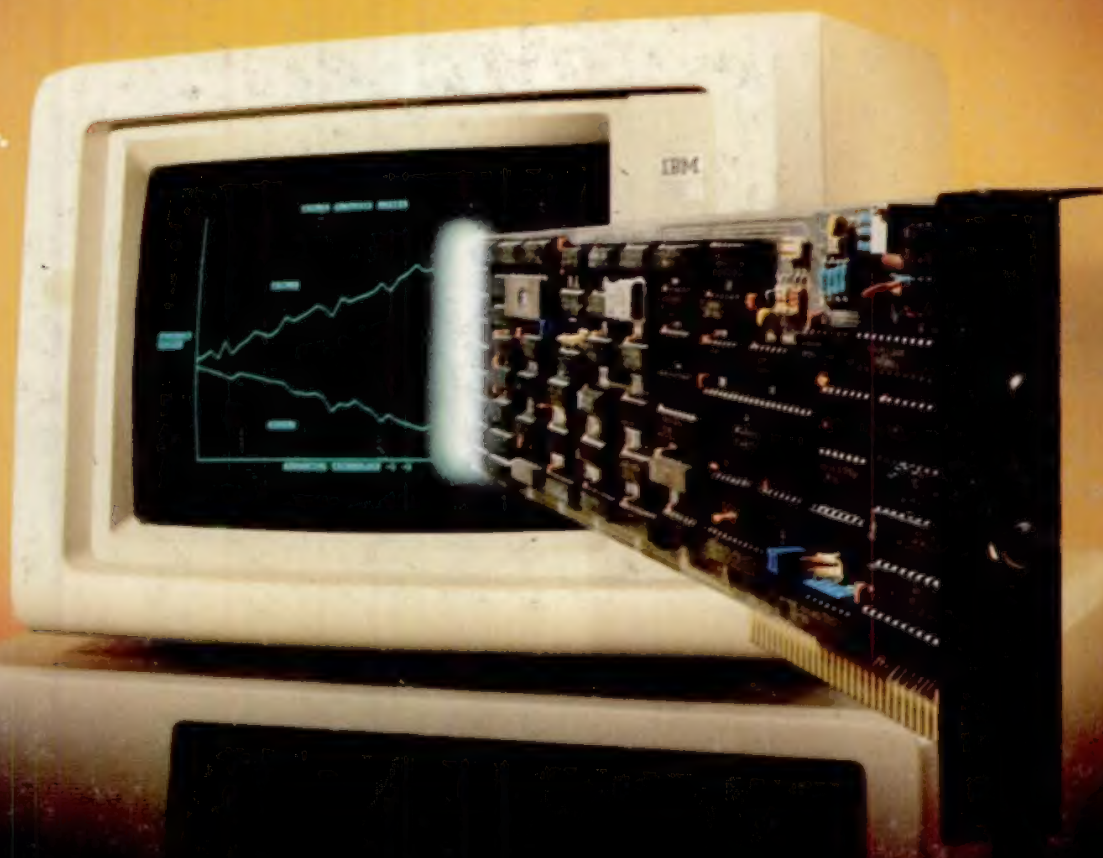
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TECMAR'S GRAPHICS MASTER.™

It adds graphics to your IBM Monochrome Display, or 16 high-resolution colors to your color monitor!

NEW
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Text or high-resolution graphics on the IBM Monochrome Display

Amazing new resolutions on standard color monitors

Complete emulation of IBM's display adapters

On standard low-scan color monitors:

- 640 horizontal x 400 vertical in 16 colors
- 720 horizontal x 480 vertical graphics in 4 colors

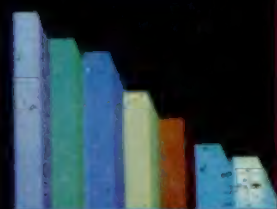
On the IBM Monochrome Display:

- 720 horizontal x 700 vertical
 - 25:50 lines of 80 characters
- Graphics Master can do much more. In all, over 30 different display modes can be used on standard monitors, and over 25 on the IBM Monochrome Display.

With certain monitors, you can achieve super-high resolutions like 512 horizontal x 420 vertical in up to 16 colors without interlace.

Graphics Master is equipped with a full 128K of on-board display buffer memory. In low-resolution modes, extra memory isn't wasted. You can divide it up into alternate display screens or use it for general data storage.

Graphics Master retains complete compatibility with the IBM Monochrome and Color Graphics Adapters. Use it to accompany or replace one or both of the IBM cards.



Graphics Master will run with all IBM software for the Personal Computer, including BASIC's graphics commands.

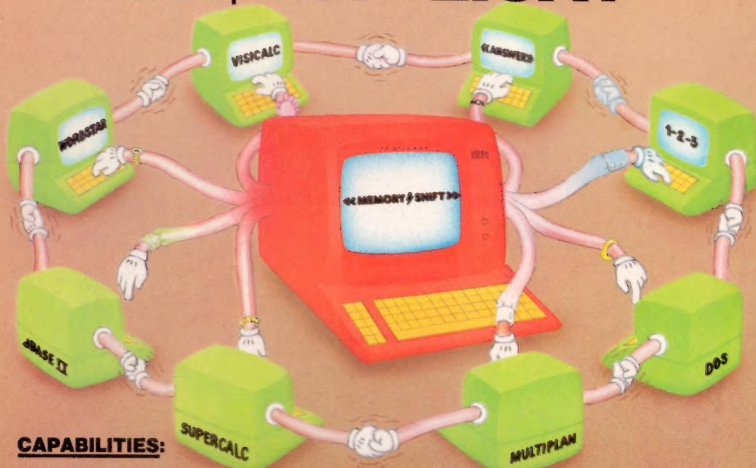
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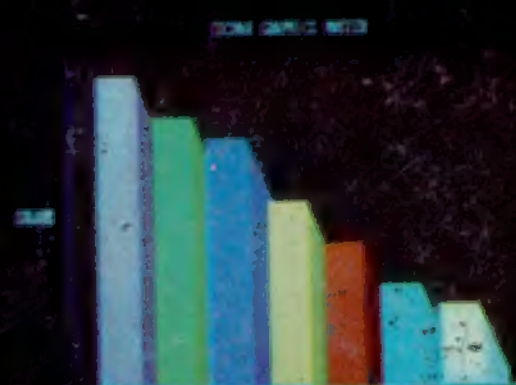
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